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"THE DEGENERATION OF LIFE."

Proof from Life Tables.

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ARE we saving at the spigot and losing at the bunghole? The children born today have more chance to grow to middle age than they had a half century ago, but having reached middle age they have a smaller chance to reach the allotted "three score and ten" than they had then.

We are told that from the minute we begin to live, from that minute we begin to die; the elapsing interval may be termed "Life," the duration of which in the individual is and will always remain problematical. This seems hardly true in some respects from the curve of the "Expectation of Life," as the curve ascends rapidly after the first year for a short period before beginning its downward course; this is due to the high specific death-rate under one year; as we progress in the educational work for infants this portion of the curve will be gradually flattened.

To lengthen this interval between birth and death has been the aim of the medical profession since the days of Esculapius, but within a generation, in fact since the days of Pasteur, has arisen a new school which is destined to crowd the healers for place—the school, wrongfully termed "Preventive Medicine," wrongfully termed because "prevention" requires no medicine; its use for the individual has passed when medicine is required, except in controlling the relation of the individual to society.

We stated that the duration of life in the individual will always be problematical, but science can forecast with amazing accuracy the probable duration of the lives of a given group of persons—the larger and more select the group, the more accurate the forecast. A forecast for a million people will be more accurate than one for a thousand selected from the same source. So, also, one made for a selected class will be more accurate than one made for the people as a whole; therefore, selections for sex, color, nativity, and parent nativity, all gain in accuracy as additional refinements are made.

There have been constructed several forms of life tables, and they represent four important elements, viz.:

The Probability of Living One Year;
The Expectation of Life;
The Most Probable Lifetime;
The Vie Probable.

The Probability of Living One Year may be described as the relation of the number of persons of any given group alive at the end of the year to the number alive at the beginning of the year.

The most Probable Lifetime is the difference between the age of a person and the age at which the greatest number of persons die.

The Vie Probable is the age to which a person has an even chance of living.

The Expectation of Life, the element to which we will give the most careful consideration in this paper, may be best defined as the number of years which an average number of persons of a given age will probably live. Manifestly, it has no possible relation to the time when any individual will die, nor yet to the time when death may be considered most probable. There is probably no term of like character which is so generally misunderstood by the public, and the writer is of the opinion that no small part of this misunderstanding is due to the practice of irresponsible insurance agents who, through ignorance probably, attempt to convince people that this is the basis upon which life insurance rates are based.

Quoting from Moir:

"The term 'Expectation of Life' is one which is much used and is frequently *supposed* by the uninstructed to be the basis of actuarial calculation. The function has often been *erroneously used* for calculations involving monetary payments and the misunderstanding is one which it is exceedingly difficult to correct. Writer after writer on such subjects has called attention to the true situation, and yet the error survives of supposing that a calculation for a fixed period equal to the Expectation of Life will give an accurate result, the same as a calculation made correctly by using the probabilities of living each year during life.

"By taking the Expectation of Life and calculating an annuity for this period as a fixed term, the result is always greater than the true value of a life annuity. If a similar method be applied to the calculation of life insurance premiums, the result is always too small."

As a basis of comparison, however, between communities, it is most valuable. Age discrepancies, characteristic of the different communities, being equalized with much greater refinement than is possible by any of the ordinary processes of correction or standardization.

It is of equal value for historical comparison, and for that reason it is my purpose to use it to show some of the gains and some of the losses that are apparent as the result of and in spite of our sanitary and hygienic efforts.

For the purpose of showing the degeneration of life, or what might be more accurately described as the "Expectancy Loss" in the later age groups, there have been selected five states which present a somewhat wide range of characteristics, both geograph-

ically and in type of inhabitants. These states are Massachusetts, Ohio, Michigan, Indiana, and California.

For each of these states life tables were computed for the years 1860, 1880, 1900 and 1910 except in California where the table for 1860 was omitted for obvious reasons. In the preparation of these life tables the information was obtained from the Census tables and the number of deaths given in the various age groups were plotted, and the number at each age thus ascertained; where possible, the figures for the years next preceding and following the census, as well as for the census year, were taken and the average ascertained. The population for the census year was taken thereby avoiding the possible errors of "estimated" populations.

The "radix" of 100,000 was used at the beginning of life and the specific death-rate for under one year applied, and the rate for each year was applied to the number remaining until the specific death-rate reached the 1,000 per 1,000 the formula used being that described by Moir as

$$e_x = \frac{\frac{1}{2}l_x + l_{x+1} + l_{x+2} + l_{x+3} + \cdots}{l_x} = \frac{1}{2} + e_x.$$

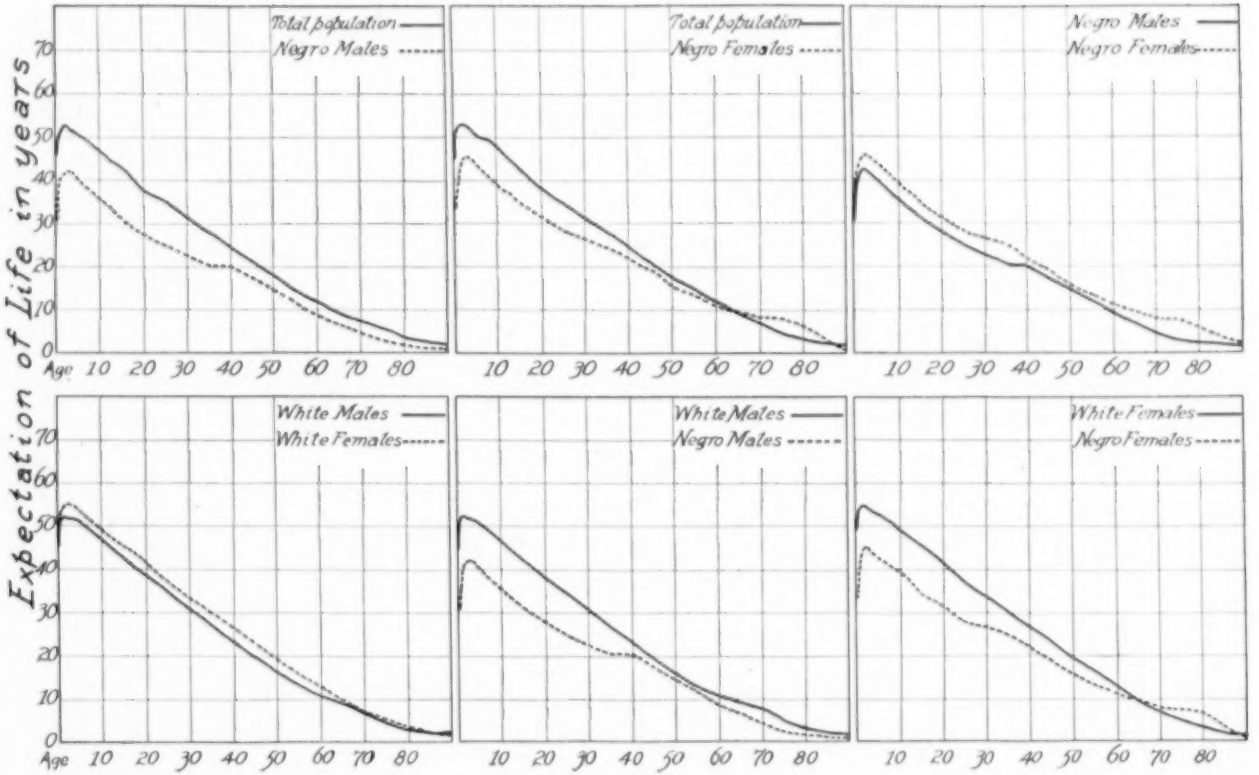
Let us first consider Massachusetts, an old, well-established commonwealth in which much has been done for the public health but where the work has been greatly hampered by "tradition." Here we find a gradual increase in the expectation of life for each age in the comparison between 1860 and 1880 from under one year until the twenty-first year, when the expectation of 1860 is 42.15 years and in 1880 is 42.11 years, and for all ages above twenty-one there is a gradual widening of difference until the sixty-sixth year when the difference is 1.37 years, after which it gradually narrows again. Between 1880 and 1900 there is another marked increase in the early ages, but at twenty years the curves cross and from then on the expectation is less in 1900 than in 1880. Between 1900 and 1910 the increase in the early ages, while not so marked, is persistent until the fiftieth year, after which the expectation is slightly less in 1910 than in 1900. Taking the half century for comparison, we find a marked increase in the early years, which increase is gradually lessening until the twenty-third year, after which the expectation in 1910 is much below that of 1860.

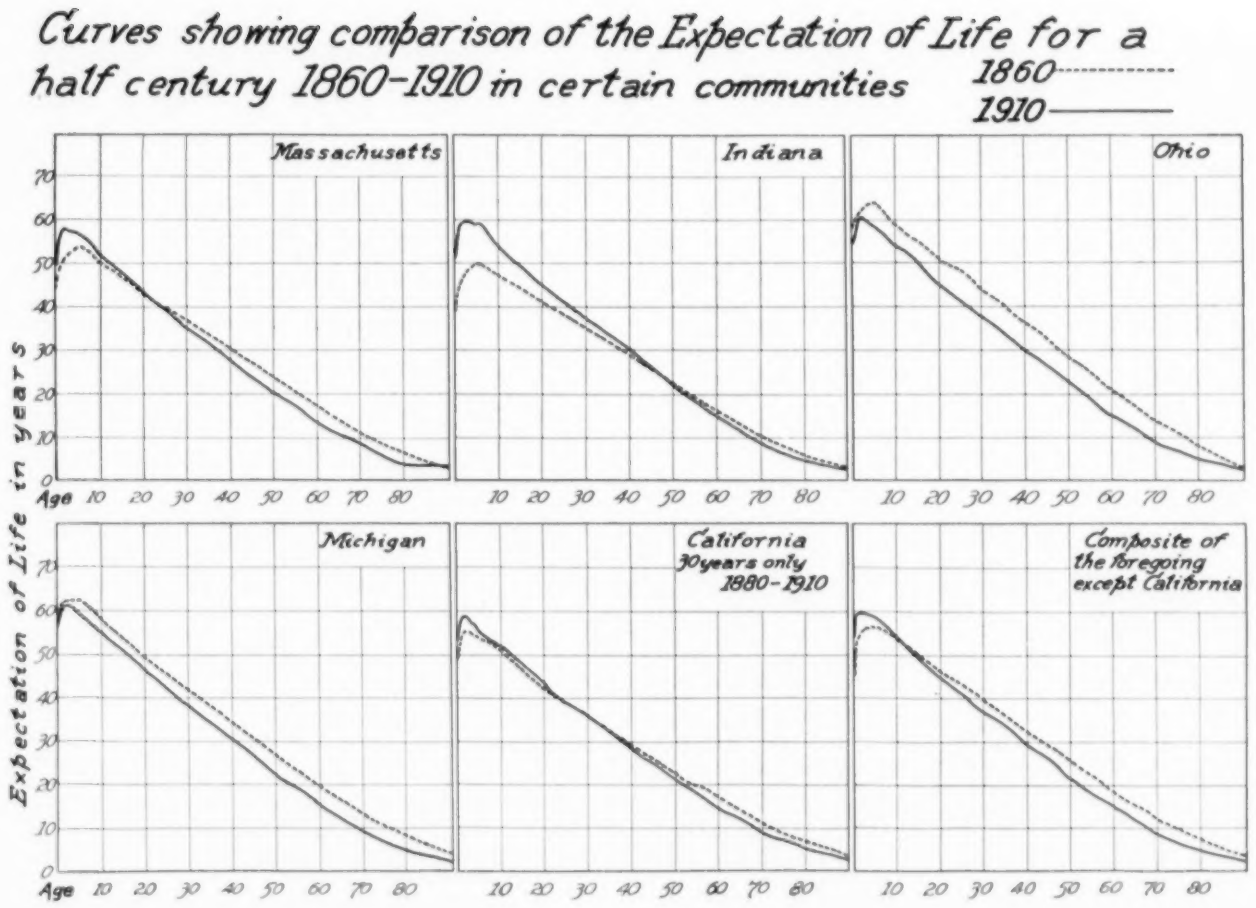
To illustrate the differences more clearly, the summation of the years of expectation up to the twenty-second year, inclusive for 1860, is 1,104.29 years and for 1910 is 1,161.37 years; this shows a gain for 1910 of about 5 per cent. On the other hand, the summation of the years from the twenty-third year on show for 1860, 1,398.42 years and for 1910, 1,247.11 years, or a decrease for 1910 of about $10\frac{1}{2}$ per cent.

In Indiana we find a similar condition existing, but in the comparison of the half century we find the increase of 1910 over 1860 continues to the forty-seventh year with a more marked gain in the early years, as will be noted from the illustrations herewith.

In Ohio we find a somewhat different condition, in the fact that in 1860 the expectation in the earlier years was

Comparison of the "Expectation of Life" by sex and color, Topeka experience.




Curves showing comparison of the Expectation of Life for a half century 1860-1910 in certain communities
1860
1910
Massachusetts
Indiana
Ohio
Michigan
California 30 years only 1880-1910
Composite of the foregoing except California
Expectation of Life in years
Age
0 10 20 30 40 50 60 70 80

greater than any of the other years presented, although the comparison of 1880 with 1910 shows an increase for 1910. This condition being so unusual naturally leads to a doubt of the accuracy of the 1860 reports.

In Michigan there is much less difference between 1860 and 1910 than in the other states, but still a difference is apparent.

In California the same loss in later life is to be observed.

In all cases it is interesting to note that there is much less difference between 1900 and 1910 than would be expected by comparison of the twenty-year periods previous thereto. Does this mean that we are holding our own better the last decade?

The illustrations on pages 814–815 speak far more plainly than it is possible for pen to describe the fact that we are losing ground with those ills which afflict mankind after passing middle age. Much has been said and written of late years to the effect that, while our public health work was saving many young lives, it was of questionable advantage to the race because it was causing the "survival of the unfit." Such an expression intended to reduce or hamper the work now being done cannot be given serious consideration by any one having the real welfare of the people at heart, but it seems to merit earnest thought of its effect upon the curve of our life tables.

To those of our children of low vitality and weak resistance, the group of diseases commonly referred to as the "acute infectious diseases" are frequently fatal; it takes a strong and vigorous body to resist the attacks of whooping-cough, measles, scarlet fever, and diphtheria, and a generation ago, before the days of antitoxins and serotherapy, the weak were generally eliminated. Those who escaped the infection were usually of the robust type, who were able to resist the degenerative action of the diseases of later life.

It must be remembered, however, that those who suffer from these diseases and recover frequently have a weakened condition of the heart, kidneys, or liver, which may not betray itself until some minor illness of later life causes an "explosion" and they rapidly succumb. This feature was clearly brought out last year before this Association in the very excellent paper by Dr. Louis I. Dublin.

It is certainly of tremendous interest to note the increased "Expectation of Life" in the early ages; certainly we must congratulate those responsible for this splendid achievement. The causes for this result may be briefly stated as follows:

(a) Adequate Laws;
(b) Efficient Administration;
(c) Education;
(d) Vital Statistics.

In these days, when Congress and most of the state legislatures are busy with legislation to protect the people from various kinds of exploiters, it seems, indeed, strange that we experience such difficulty in securing proper laws to protect the people from themselves; but in spite of the difficulty some very wise and far reaching legislation has been the product of recent years, and the health officer of today can perform his duties with much

greater assurance of the support of law and of public sentiment. No law will enforce itself, and to the efficient enforcement of the law due credit must be given and it is encouraging to note that efficiency is now rather the rule than the exception.

By no means the least of the elements that has brought the reduced death-rate and the increased expectancy is the education of the people themselves; carried on as it has been the past few years by many agencies, it is proving well worth while.

That many of the states now have adequate vital statistics and trained health officers are by them able to find the sources of trouble and to eradicate them, may be considered as one of the most important of the elements to be credited with the results. In some of the states the vital statistics department is not connected with the health department. This seems a mistake, as the subsequent use of vital records for legal purposes is by no means impaired by their immediate use for sanitary purposes.

But while we congratulate the race upon this increase for the children, we must bend our energies to such work, hygienic and educational, as will tend to bring the curve to more satisfactory form.

One of the students at the University of Kansas last year in response to the question, "What is the purpose of public health work?" replied, with that brevity called in the Kansas language "pat," "To take the bumps out of the curve."

The tables on pages 818–819 show the comparison of the expectation for the first five years and for each five years thereafter, in the states referred to previously.

Are we disposed to be selective in our public health work? It would seem so at times, when we consider the exceedingly high death-rates among the negroes, particularly from tuberculosis. Where the population of any community includes any considerable number of this race we should not fail to consider this in making any study of death-rates. The accompanying illustrations of the comparisons of the expectation between the white and negro population of the city of Topeka are both illuminating and instructive. The wide difference in the expectation between the white and negro and between the sexes is vividly portrayed and those who have made any study of the social condition of the negro and the apparent indifference or ignorance of the simplest rules of hygiene must be impressed with the necessity of more aggressive work among these people. Regardless of any other reason, this work is necessary for self protection, for as Schneider very pointedly said, "The same germ that causes disease in the negro will cause it in the white."

In the preparation of these tables, based on a small population, it is necessary to "smooth" the death curve to some extent to cover the fluctuations which always appear in small groups of deaths, but these tables are based on actual reported ages and not prepared from "age groups," so that the tendency of the curve was well established and but slight "smoothing" was necessary.

While from an actuarial standpoint these tables are possibly of slight value,

as a means of studying existing relative sanitary conditions they are of great value. It is to be regretted that there is not sufficient data available to make historic comparisons of the same groups.

A similar set of tables for Kansas City, Kansas and Jacksonville, Florida, further emphasize this but do not offer anything additional and are, therefore, omitted.

Thanks are hereby extended to George C. Whipple, professor of sanitary engineering, Harvard University, under whose direction this work was begun.

HISTORIC COMPARISON—EXPECTATION OF LIFE TABLES.

Massachusetts.

	Expectation of Life in Years.			
Age.	*1860.*	*1880.*	*1900.*	*1910.*
Under 1	44.23	41.77	45.31	49.50
1	49.90	50.74	54.02	56.68
2	51.50	52.81	55.46	57.79
3	52.52	53.27	55.52	57.45
4	53.09	53.50	55.14	56.93
5	53.22	53.30	54.75	56.28
10	49.88	50.61	50.82	52.17
15	46.18	46.38	46.69	47.60
20	42.65	42.78	42.50	43.52
25	39.70	39.62	38.43	39.33
30	36.65	36.31	34.86	35.40
35	33.43	33.0	31.26	31.55
40	30.25	29.76	27.64	27.73
45	26.90	26.06	23.95	24.07
50	23.74	22.75	20.45	20.30
55	20.33	19.09	17.15	16.92
60	17.06	15.85	14.12	13.81
65	14.06	12.70	11.22	11.07
70	11.18	10.08	8.73	8.69
75	8.97	7.64	6.56	6.60
80	6.78	5.67	4.92	3.75
85	4.95	4.13	3.53	3.56
90	3.36	3.08	2.56	2.55
95	1.92	1.84	1.69	1.58

Indiana.

	Expectation of Life in Years.			
Age.	*1860.*	*1880.*	*1900.*	*1910.*
Under 1	39.14	46.55	52.50	54.53
1	44.49	52.26	57.36	59.50
2	46.69	53.62	58.05	59.30
3	48.36	53.91	58.0	59.50
4	49.12	53.88	57.42	58.85
5	49.13	53.61	56.71	58.09
10	47.60	50.58	52.62	53.86
15	44.50	46.79	48.61	49.50

Indiana—*Continued.*

	Expectation of Life in Years.			
Age.	*1860.*	*1880.*	*1900.*	*1910.*
20	41.40	43.34	44.98	45.38
25	38.40	40.18	41.45	41.68
30	35.40	37.0	38.01	37.82
35	32.36	33.70	34.35	33.91
40	29.27	30.64	30.64	30.05
45	25.99	27.14	26.89	26.21
50	22.52	23.79	23.13	22.36
55	19.20	20.31	19.48	18.63
60	16.15	16.98	16.15	15.16
65	13.16	14.04	12.84	11.92
70	10.45	10.77	9.97	9.21
75	8.02	8.20	7.83	6.75
80	6.09	6.35	6.17	4.90
85	4.64	4.98	4.20	3.43
90	3.32	3.69	2.72	2.54
95	2.05	2.16	1.80	1.55

Ohio.

	Expectation of Life in Years.			
Age.	*1860.*	*1880.*	*1900.*	*1910.*
Under 1	57.76	51.50	53.70	54.62
1	60.80	57.14	58.55	59.70
2	61.72	58.22	59.13	60.12
3	62.25	58.41	58.84	59.68
4	62.30	58.08	58.42	58.95
5	62.09	57.66	57.77	58.26
10	59.18	54.41	53.82	54.02
15	54.86	50.19	49.38	49.61
20	51.13	46.28	45.45	45.39
25	47.46	42.86	41.74	41.48
30	43.87	39.27	38.06	37.61
35	39.98	35.62	34.31	33.78
40	36.22	31.96	30.52	29.88
45	32.40	28.26	26.82	26.11
50	28.55	24.48	23.08	22.32
55	24.75	20.77	19.42	18.77

OHIO—*Continued.*

	Expectation of Life in Years.			
Age.	*1860.*	*1880.*	*1900.*	*1910.*
60	20.95	17.16	16.01	15.33
65	17.36	13.80	12.76	12.19
70	13.97	10.87	9.98	9.34
75	10.95	8.31	7.62	6.95
80	8.05	6.18	5.66	5.27
85	5.31	4.61	4.07	3.66
90	2.97	3.30	2.78	2.79
95	1.42	1.78	1.48	1.62

MICHIGAN.

	Expectation of Life in Years.			
Age.	*1860.*	*1880.*	*1900.*	*1910.*
Under 1	57.59	53.26	51.79	57.11
1	60.65	58.25	57.95	61.32
2	61.03	59.08	58.52	60.80
3	61.05	60.09	58.37	60.30
4	61.08	59.10	57.83	59.58
5	61.09	58.72	57.18	58.80
10	57.75	56.05	53.05	54.59
15	53.46	52.11	48.82	50.15
20	49.46	48.45	44.86	46.23
25	45.74	44.79	41.18	42.15
30	42.14	40.39	37.54	38.18
35	38.24	37.15	33.76	34.19
40	34.25	33.23	30.05	30.26
45	30.38	29.23	26.24	26.25
50	26.58	25.44	22.48	22.45
55	22.90	21.54	18.82	18.79
60	19.55	17.89	15.34	15.26
65	16.30	14.41	12.20	12.06
70	13.12	11.37	9.32	9.26
75	10.43	8.74	7.0	6.84
80	8.27	6.30	5.11	5.04
85	6.19	4.45	3.63	3.74
90	3.85	2.75	2.57	2.54
95	2.02	1.65	1.49	1.62

CALIFORNIA.

	Expectation of Life in Years.		
Age.	*1880.*	*1900.*	*1910.*
Under 1	49.16	49.95	53.43
1	54.71	54.40	57.69
2	55.21	54.78	59.0
3	55.09	54.45	57.40
4	54.78	53.94	56.61
5	54.22	53.25	55.92

CALIFORNIA—*Continued.*

	Expectation of Life in Years.		
Age.	*1880.*	*1900.*	*1910.*
10	50.60	49.45	51.73
15	46.40	45.25	47.24
20	42.45	41.35	43.18
25	39.0	37.93	39.29
30	35.74	34.69	35.56
35	32.44	31.27	31.91
40	29.30	27.90	28.31
45	25.74	24.47	24.65
50	22.68	21.17	21.15
55	19.55	18.04	17.80
60	16.69	14.93	14.79
65	13.56	12.06	11.76
70	11.07	9.50	9.23
75	8.81	7.27	7.02
80	7.15	5.43	5.14
85	5.38	3.77	3.81
90	3.60	2.77	3.11
95	1.93	1.83	2.30

COMPOSITE OF MASSACHUSETTS, OHIO, INDIANA AND MICHIGAN.

	Expectation of Life in Years.	
Age.	*1860.*	*1910.*
Under 1	44.68	53.94
1	53.96	59.30
2	55.19	59.50
3	56.04	59.23
4	56.39	58.57
5	56.38	57.85
10	53.60	53.66
15	49.77	49.21
20	46.16	45.13
25	42.82	41.16
30	39.51	37.25
35	36.00	33.35
40	32.49	29.48
45	28.92	25.66
50	25.35	21.88
55	21.79	18.27
60	18.42	14.89
65	15.22	11.81
70	12.18	9.12
75	9.59	6.78
80	7.29	4.74
85	5.27	3.59
90	3.37	2.60
95	1.85	1.59

A STUDY OF METHODS OF SEWAGE DISPOSAL IN INDUSTRIAL AND RURAL COMMUNITIES AND SUGGESTIONS FOR THEIR IMPROVEMENT.

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I. INTRODUCTION.

THE main objects of this paper are to review briefly the usual methods of disposal of human excreta observed by this Commission* in the South, more particularly those in use in industrial communities; to discuss in detail actual improvements in methods of disposal which have been made in certain industrial communities, the amount of money invested in such improvements and maintenance charges for same; to outline the amount of capital required to put in modern sanitary improvements; and, finally, to consider the returns which may be expected on such investments, not only from the standpoint of improvements in the general health and efficiency of the community, but also the net income in money which may be earned.

For much of the material incorporated in this paper we are indebted to the presidents of Spartan Mills, Spartanburg, S. C., Duncan Mills, Greenville, S. C., Newry Mill, Newry, S. C., Republic Mill, Great Falls, S. C., and Erlanger Mill, Lexington, N. C. We desire also to make special acknowledgment to Mr. J. E. Sirrine, mill architect and engineer, Greenville, S. C., for estimates which he has very kindly had prepared for us.

II. DISCUSSION OF THE USUAL METHODS OF SEWAGE DISPOSAL ADOPTED IN THE SOUTHERN STATES.

In investigating methods of sewage disposal in the southern states, the conclusion is inevitable that they are, in most sections and in many communities, most inefficient and unsatisfactory.

In rural communities the usual method of disposal provided is the open surface privy, though the whites occasionally, and the negroes frequently, have no provision whatever, as has been brought out by the investigations of the Rockefeller Sanitary Commission. This Commission reports that inspection of 189,586 farmhouses taken at random in eleven states, disclosed the fact that 95,988, or 51 per cent. of them had no privy, while the general sanitary index was only 5.8 out of a possible rating of 100.

Practically all towns and cities, of sufficient size to justify such expenditure, have sewage disposal plants. In certain sections of such towns and cities, with a few striking exceptions, open surface privies are permitted.

The industrial communities with which this paper is more particularly concerned, are those devoted to the manufacture of cotton cloth—cotton mill villages. When these cotton

*From the Robt. M. Thompson Pellagra Commission of the New York Post-Graduate Medical School.

mills are constructed it is customary for the owners to build in their immediate vicinity a complete village, including dwelling houses, stores, market, church, recreation hall and school. In most villages the tenants are also provided with a plot of ground for garden, and with stables and pasture for cows. In these communities the methods for disposal of human excreta are usually unhygienic and highly unsatisfactory. In many, the unscreened surface privy is the method adopted. In some a pail system is in use, and but rarely are such privies rendered fly-proof.

With such methods of disposal in force, correlated with congestion of population in these villages, the ill effects following soil pollution and contamination by mechanical means are vastly greater than is the case in rural communities, where the population is sparse and families live at much greater distances apart.

The methods of ultimate disposal in these industrial communities vary. In some the privies are built over ditches, surface water being relied on to remove the collections. The plan usually adopted is removal once a week by scavenger service. In some of the villages studied, a pail system (unscreened) has been installed and a regular scavenger empties each pail twice a week and carts the excreta away; in others the scavenger buries the excreta beside the privy once a week. In a few such communities no regular or systematic arrangement for ultimate disposal is in force, and the privies are cleaned at irregular intervals.

In arriving at the cost of maintenance for these inefficient methods of disposal, it is necessary to consider a number of factors, among which may be mentioned expenses incident to construction and repair of outhouses used as privies, wages of scavenger, cost of new pails to replace those worn out, interest on money invested in team and disposal cart, wear and tear on wagon and team, feed for team and other incidentals.

We have endeavored to obtain these figures from the mill authorities of eleven mills. The cost of maintenance varied considerably and was contingent upon the efficiency of the system in force. The main item of expense was that of the scavenger, whose wages per year ranged from $130 to $360.

The figures given us as covering total maintenance charges ranged from $200 to $630 per annum, the average being $435. The communities considered had population of from 600 to 1,800 people.

III. Discussion of Efficient Methods of Disposal Adopted in Certain Communities.

In some rural communities, in some towns and cities, and in a few industrial communities investigated, sanitary conditions were much above the average. It is our intention to discuss in detail but one phase of these sanitary advances, namely, improvements in sanitation in industrial communities.

In rural districts the health authorities in many of the southern states are already making much progress. The Rockefeller Sanitary Commission

is at the present time adding great impetus to this work through its efforts to organize model rural communities in many of the southern states.

In many towns and cities the governing authorities are beginning to have some conception of the benefits accruing from modern methods of sanitation and are enacting ordinances looking to the institution of such methods. As one example of what may be accomplished, we cite the city of Spartanburg, S. C., with a population of 17,517 (census 1910). In the fall of 1913 an ordinance was enacted, at the suggestion of the city health authorities, requiring that all residences within 300 feet of a sewer main install water closets and that all located beyond this limit be provided with sanitary closets —pail system, fly-proof. Dr. C. F. Kaupp, the health officer, informed us in October, 1914, that during the past year 1,000 sewer connections had been made and 1,500 sanitary privies installed. This was accomplished with a negligible number of prosecutions. It must be understood, of course, that prior to the passage of this ordinance, sanitary conditions in Spartanburg were as good as those usually encountered in cities of like size in the southern states.

In industrial communities but little progress has been made. The major part of the work of this Commission has been undertaken in the Piedmont section of South Carolina, where the development of cotton manufacture during the past twenty years, has been phenomenal. The usual methods of sewage disposal in these communities—unscreened surface or pail privies—have already been considered.

In a few mill villages which we have studied, the authorities have seen fit to install water-carriage sewage disposal plants. As a number of inquiries have reached us concerning the cost of installation of such systems, we consider it desirable to present such information as we have been able to collect. This information will be discussed from two points of view; first, original cost of disposal plant (permanent improvements); second, maintenance charges.

A combined sewage disposal plant and water supply system has been installed in the Spartan Mill Village, Spartanburg, S. C. This village has 270 houses, some of which are double. Three hundred and sixteen separate connections were made. Installations were begun in September, 1913, and completed in May, 1914.

Permanent Improvements.—The sewage disposal plant for the 316 tenements including sewers, plumbing, non-freezing flush closets and other fixtures for houses, water connections for closets, and an undetermined number of water connections and kitchen sinks for domestic purposes, cost approximately $25,000 or at the rate of $79 per house.

A piped water supply for domestic purposes had been installed in a number of these tenements or on their premises, prior to the installation of the sewage disposal plant, but many such connections were made when water closets were placed in the houses. No separate figures were available covering the cost of the water supply system, and part of the $25,000 ex-

pended should justly be charged against the water supply system. The system adopted provides fire plugs for fire protection, thereby reducing insurance rates.

It may conservatively be estimated that the cost of the combined water and sewerage system in this village did not exceed $39,000.

No septic tank was provided, as the sewer mains become continuous with those of the city.

No independent source of water supply was provided, the supply being purchased from the city at a flat rate.

Closets were built onto the back porches at a cost of approximately $1,580.

Maintenance Charges.—The company pays the city a flat rate of $2,460 per annum for water for the combined system, and it is estimated that it will cost $600 per annum for repairs and up-keep. Thus the actual maintenance charges amount to $3,060 per annum. To offset these maintenance charges, the company requires each tenant to pay $1 per month additional rent to cover sanitary conveniences. It is estimated that at least 290 of the 316 houses are occupied at all times, from which the income is $3,480. This leaves approximately $420 to cover interest on the investment of $39,000 or about 1 per cent. If to this be added the $500 paid out annually for maintenance of the old system—unscreened trough closets—together with the decrease in insurance rates following better protection against fire, the income on the investment will be approximately 2 per cent.

The main item for maintenance is that paid for water, $2,460, and this item was much less in all of the other villages investigated.

The Erlanger Cotton Mill at Lexington, N. C., was completed in April, 1914 and has 83 tenements. This village, which is a model one, has a water system supplying water for domestic and all other purposes, a complete sewage disposal plant including septic tank, a complete lighting plant supplying electric lights for streets and houses, a sanitary service for kitchen and other solid wastes, and the houses are completely screened.

Permanent Improvements.—The sanitary conveniences enumerated above were placed in 83 tenements at the following cost:

Sewage disposal plant (sewer mains, house connections, plumbing, and inside fixtures)	$10,309
Water system (mains, house connections, plumbing, inside fixtures and kitchen sinks)	4,808
Septic tank	1,522
Water supply (driven wells, pump and motor)	2,500
Service tank (capacity 50,000 gallons)	2,847
Street and house lighting equipment	4,000
Garbage cans	100
Screening houses	500
Total cost of all these improvements was	$26,586

Maintenance Charges.—It is estimated by the superintendent of this mill that it cost them $200 for pumping water and maintenance of these systems, $600 for lighting the streets and houses, and $508 charged off to cover depreciation, this amount being 2 per cent. of the total amount invested in sanitary improvements. This makes a

total of $1,308 to cover all maintenance charges.

The rental charge for tenements in this village is 25 cents a week per room and it is estimated that 85 per cent. or more of the tenements are occupied continuously. The total income from this source is $3,536 per annum. The rental charge for tenements in villages without such improvements averages about 12½ cents per week a room, and half of the total income—$1,768—should justly be credited as returns on the investment in sanitary improvements. The net returns, after deducting charges for maintenance, lighting and depreciation, are $459, or 1.7 per cent.

It will be noted that everything possible has been done to safeguard the health of this community. Not only has this village the sanitary improvements just outlined but its executive heads have also employed a trained nurse whose entire time is devoted to the care of its sick and to instruction of the inhabitants in hygiene. Though only a small net return is shown on the amount invested, we are informed that the owners are perfectly satisfied with the investment and are confident that the better health conditions and greater contentment of the inhabitants will more than repay them.

We feel very confident that the degree of efficiency shown by mill operatives living under the sanitary conditions existing in this village as compared with that of operatives in the usual type of mill village in the South will demonstrate very clearly that, from this point of view alone, it will pay to install such improvements.

The Duncan Cotton Mill at Greenville, S. C., has a complete water system and sewage disposal plant for its 151 tenements. The sanitary improvements consist of a water system supplying water for domestic and flushing purposes and a complete sewage disposal plant including septic tank and filter beds.

Permanent Improvements.—The water and sewage disposal plant was installed in 151 tenements at the following cost:

Sewage disposal plant	$15,940
Water system	6,835
Service tank (50,000 gallon capacity)	3,020
Septic tank and filter beds	4,200
Driven wells, pump and motor	3,500
The total cost of these permanent improvements was	$33,495

Maintenance Charges.—No figures were available covering maintenance charges for these systems. The president of this mill informed us that it cost them about $50 *per annum* for repairs to pipes and water closets and that the engineer who cared for the pump spent the greater part of his time in the machine shops of the general plant.

The rental charge for tenements in this village is 75 cents a month per room, which is said to be the usual charge for mill tenements in Greenville, S. C., without sanitary conveniences.

The interesting observation was made that all tenement houses in this village were occupied continuously and a waiting list of families was always on file.

The Republic Cotton Mill Village at Great Falls, S. C., erected about

four years ago, is another model village. It has 100 tenements with a complete sewage disposal system, water system, and electric lights in each house.

Permanent Improvements.—The sewage disposal plant consists of sewer mains, house connections, closets in 100 tenements and also in the hotel, office, store, school and all other public buildings except the mill proper, which was under separate contract. The outlet of the sewerage plant is into the Catawba River about one mile below the plant.

The water system is quite an elaborate one supplying pure water for all purposes. The water is taken from the Catawba River and passes through a settling basin (300,000 gallon capacity), gravity and pressure filters, and finally through an ozonizing plant (Gerard system).

We were informed by the president of this mill that the total cost of these very elaborate improvements—water and sewerage systems—was $20,529.51.

Maintenance Charges.—It is estimated that the maintenance charges for the water and sewerage systems, exclusive of repairs, are not more than $150 *per annum*. The cost of repairs has been surprisingly low, not more than $100 *per annum*. The total expense for maintenance and upkeep was therefore about $250.

The usual rental charge for mill tenements in this section, without sanitary conveniences, is 75 cents a month per room, while the charge in this village is $1. The difference of 25 cents may justly be credited as direct returns on the investment. The superior type of houses in this village and the sanitary improvements which have been made attract the best and most efficient class of mill operatives. For this reason all the houses are occupied continuously and the income to be credited to improvements in sanitation is about $1,200 *per annum*. Deducting from this income the charges for upkeep and repairs ($250) and 2 per cent. on the original investment to cover depreciation ($410) there remains $540, or a direct return of $2\frac{1}{2}$ per cent. on the original investment.

That this by no means represents the actual returns on this investment is evidenced by the following quotation from a letter to us from Mr. R. S. Mebane, president of this mill:

"Since we charge 25 cents more per room per month than the average mill village in our section, we feel that this 25 cents should be credited to returns on the investment in modern sanitary improvements, and we figure this pays us a small return on the investment.

"As a matter of fact, this is not by any means what we consider to be the actual returns to us from this investment. We are convinced that by giving our operatives their comfortable, sanitary, well-lighted houses, with pure drinking water, we are actually repaid by the superior class of labor we are able to secure. We have no transient families here, so to speak, but our families continue on with us year after year, happy and satisfied. We believe the money spent for the purposes above mentioned is a direct contributory asset to the earning capacity of our

plant. We have never had any sickness to amount to anything here, and we consider it quite a remarkable statement that we have never had a case of typhoid fever. We have no wells or springs on our premises and all of our operatives are forced to use pure sterilized, ozonized water. We are so thoroughly convinced of the wisdom, from a business standpoint, of the investments above described that should we build any more plants here we are going even further along this line."

The Newry Mill in Oconee County, S. C., with a total population of 750, installed a sewage disposal plant when the mill was erected in 1892. The water closets are grouped in wooden out-houses, conveniently placed to the houses they serve. The water supply for this system is pumped directly from a nearby stream into the distributing tank. The drinking water for the village is obtained from open wells.

Mr. Courtenay, the president, informed us that the entire expense of maintenance for this system, aside from the labor of two general repair men, did not exceed $100 a year. The repair men referred to were of necessity carried on the payroll for general inspection and repair work in the village and not more than one hour per day of their time was devoted to repairs on the sewage disposal plant.

IV. Discussion of the Returns, Both Indirect and Direct, Accruing from Improvements in Sanitation.

There is but little doubt that prevention of soil pollution is one of the most important public health problems confronting the South today. Furthermore, this problem is most acute in industrial communities where, by reason of congestion of population, its ill effects become most apparent.

In certain of the southern states the expansion and growth along industrial lines during the past twenty years has been phenomenal. One industry in particular, the manufacture of cotton, has been expanding with great rapidity. The following figures, taken from the Reports of the Thirteenth Census, enable one to realize its growth. In 1899 there were in the states of Alabama, Georgia, North Carolina and South Carolina, 355 cotton factories employing 88,710 individuals, while ten years later (1909) the number of factories had increased to 595, employing 136,403 individuals. Statistical information which we have gathered indicates that each operative represents a population of about 2.3 individuals, so that it may safely be assumed that the total population of the cotton mill villages in the four states mentioned is at least 300,000.

The sanitary conditions in most of the coal mining camps, so far as we have been able to determine, is very similar to that existing in the usual cotton mill village.

In practically all of the industrial communities which we have investigated most intensively, we have observed, with great frequency, epidemics of typhoid fever and bacillary dysentery which could be traced to soil pollution. In one village there were epidemics of typhoid, bacillary dysentery and malaria at the same time.

The typhoid fever and dysentery were due in large measure to pollution of the open wells from improperly constructed sewers, and when a piped water supply was provided these two diseases were greatly diminished.

We have outlined in the forepart of this paper the methods of disposal adopted in cotton mill villages, and it seems hardly necessary to add that such methods are altogether unsatisfactory and a menace to public health.

The question then presents itself, How can this problem best be met? The ideal solution is, of course, the installation of water systems and sewage disposal plants, if this be practicable, and we believe it to be so, if not in all, certainly in many such communities.

The stockholders in these mills are, of course, looking to those in immediate control for reasonable returns on their investment, and before expending from $15,000 to $40,000 in permanent sanitary improvements, the executive heads must necessarily be convinced that the investment will show a profit either indirectly, directly, or both.

Indirect Returns.—Some executives are content with indirect returns on the investment, that is to say, the contentment of the people and better health conditions. These factors make for greater efficiency, and, after all, the degree of efficiency shown by the operatives is the determining factor governing success. We have investigated general health conditions in mill villages with proper sanitary conveniences and in those without such conveniences. The almost complete absence of typhoid fever, diarrheas and dysenteries in the former as compared with their usual great prevalence in the latter has been forcibly impressed upon us. Any measures which tend to better health conditions in these communities by the control of disease naturally result in an increase in efficiency. We feel perfectly confident that investments in sanitary improvements will yield abundant returns in this indirect fashion. This feeling of assurance is based mainly on information given us by executives of mills relative to actual amount of manufactured products which their mills make up from week to week and from month to month.

Direct Returns.—Dismissing, however, the question of indirect returns, is it possible that such investments can be made to show direct returns, that is to say, a reasonable rate of interest on the capital invested? We believe that in most instances it will, provided the rental charges be increased sufficiently to cover such improvements. An increase of between $1 and $2 per month will usually be amply sufficient to show a small direct return on the investment.

This brings up the question as to whether an additional charge is justifiable under the prevailing labor conditions in the South, and as to whether the objection on the part of the tenants to paying such charges will be so great as to upset local labor conditions. In the Piedmont section of South Carolina the rental charge for the mill village tenements averages about 50 cents a room per month. These tenements usually have from 3 to 6 rooms, so that the house rent per month ranges

from $1.50 to $3. The income from this source is supposed to cover necessary expenditures for repairs, painting, etc., but we have been informed by a number of mill executives that such is not the case. It follows, therefore, that there is no direct monetary return on the capital invested in tenements and land on which they are erected. The executives of the mills consider that the difference between the rents actually paid and the rents which should be paid in order to show a reasonable income on the capital so invested, represents, in fact, a part of the gross earnings of the operatives. This becomes quite an item in mills situated in towns and cities, as the type of house similar to those found in these villages rents at from $9 to $12 per month. In fact, we know of a few instances in which the mill workers owning property in the vicinity of such mills follow the practice of renting their own houses at $10 or more per month and living in mill houses at $3 per month.

As to actual wages paid employees in cotton mills, the 1910 Report of the Bureau of the Census shows that in 1899, in the state of South Carolina, there were 30,621 individuals employed in cotton manufacture, the wages paid them amounting to $5,067,000, or an average of $165 per year for each individual. In 1909 there were 46,342 persons so employed and their wages had increased to $11,661,000 or $352 per year for each individual. The number of wage-earners in each family varies from 1 to 5, or even more, the average being about 2. We have been informed that the *per diem* wage paid adults in these mills 20 years ago was 60 cents while now it is from $1 to $1.20.

Twenty-six per cent. of the employees of 6 cotton mills intensively studied in Spartanburg County were individuals from 12 to 16 years of age, and it was not at all unusual to find that employees of this age earned from 85 cents to $1 or even more per day. Some of the adults earned $2 per day or even more on piece work. We know of many families earning between $125 and $175 per month. The average number of operatives per family in the Piedmont section of South Carolina is about 2, and it may safely be estimated that the income per family will average at least $50 a month, and probably more. The industrial population in the Piedmont section expends much of its earnings injudiciously. They are a boon to patent medicine fakirs, itinerant peddlers and local establishments doing business on the so-called "installment plan." The managers of the mill company stores, without exception, tell us that they will buy no foodstuffs other than those of the best quality. In the course of a house to house canvass of the Spartan Mill village in Spartanburg, S. C., one of us interrogated each housewife in about 50 of the tenements as to whether she was pleased with the recent improvements in sanitation—a water system for domestic use and flush closet in each house—and if the family objected to paying $1 for these conveniences. With one exception, their reply was that it was infinitely superior to the old system, and that they did not object to the extra charge of $1 per month.

Other members of our working party have occasionally been told by tenants that in their opinion the mill company should not make extra charges for sanitary improvements.

When one has seen, as we have, the great prevalence of typhoid fever, bacillary dysentery, hookworm disease and summer diarrheas in these communities, we feel that there will be no hesitancy in concluding that the expenditure of from $1 to $2 per month by each household for improvements in sanitation will result in greater contentment, markedly better health conditions and the natural correlative, increased efficiency and greater earning power.

If it be granted that it will entail no hardship on the occupants of houses in these communities to pay additional rents of from $1 to $2 per month to cover sanitary improvements, can the executive heads of these industries look forward to a reasonable return on the amount invested in permanent sanitary improvements? We believe that in almost all instances this can be answered in the affirmative. We have discussed already the cost of installation of permanent sanitary improvements in 5 mill villages, these improvements ranging from one having a sewage disposal plant only, to those with elaborate systems for the purification of the water supply as well as complete sewage disposal plants, electric lights, screened houses and other sanitary conveniences.

The actual cost of installation of water systems or sewage disposal plants or both, will vary in different sections. For example, it might be possible in one locality to secure a potable and adequate supply of water from driven wells at moderate expense, or even from such wells already in use, while in other localities the supply would have to be obtained directly from streams, necessitating the installation of one of the more expensive plants for purification by mechanical or chemical methods.

The sewage disposal plant would also offer problems for solution. Practically all of the older mills in the Piedmont section of South Carolina are built alongside streams, the villages themselves being built on the adjacent hillsides. Superficial examination of these villages might lead one to conclude that by reason of broken topography, the cost of installing a sewage disposal plant would be prohibitive—in fact, we have had mill executives offer this as their main argument against making such improvements. As a matter of actual fact, engineers have informed us that the topography of such villages could very frequently be used to great advantage in actually reducing quite materially the cost of construction.

Another question which merits careful consideration is the final disposal of the sewage. In most instances streams are available into which the sewage may be discharged.

In some of the southern states laws have already been enacted requiring industrial communities to submit their sewage to some one of the approved methods of treatment before it is discharged into streams. A number of cotton mills have complied with this law, more particularly those erected

during the past five years. Comparatively few of the cities and towns of the South have plants for the treatment of sewage, and we know that a very large number discharge their untreated sewage into streams which are manifestly of insufficient volume to care for it properly. There are cities and towns in the South having within their corporate limits mills which have complied with the state laws governing treatment of sewage, while these cities and towns discharge immensely larger volumes of untreated sewage into nearby streams. If mill corporations are required, by law, to treat the sewage from their plants, municipalities with sewage disposal plants should certainly be required to do the same thing, provided the streams for ultimate disposal are not of sufficient volume properly to care for it.

The advisability of discharging untreated sewage into streams will depend mainly on the relative volumes of the sewage and the stream of water into which it flows, the character of the water, and the use to be made of the water lower down stream. In most cases it would be desirable to submit the sewage to some one of the approved forms of treatment before its discharge into streams. The method of treatment usually to be recommended would be the septic tank followed by passage over filter beds.

For the reasons which we have mentioned, as well as many others, it is very necessary that engineers competent to deal with all the problems connected with the installation of sanitary improvements, be consulted, otherwise grave errors are possible; or unnecessary expenses may be incurred.

Mr. J. E. Sirrine, an engineer of Greenville, S. C., has furnished us estimates based on actual construction, showing the average cost of installing the different units of water and sewerage systems in industrial communities, which may be summarized as shown in the table on the following page.

Practically all the figures given in this table are based on averages obtained from actual construction. In some localities they would be much lower, while in others they might be in excess.

Taking the Erlanger Mill at Lexington, N. C., as an example, we find that their sewage disposal plant (including septic tank) and water system would cost, according to these estimates, $19,535. These units actually cost them only $16,495.

The cost of maintenance and upkeep for these improvements also varies and is dependent on local conditions. In industrial communities certain of the overhead charges necessary in municipal plants would be much reduced. The engine-room force for the mill proper could care for the pumping plant without additional expense, and as it is also necessary for these mills to employ mechanics, carpenters and inspectors for general work around the plant, this force could attend to repairs on the sewerage and water systems at but little extra expense—probably averaging not more than an hour a day. The cost of pumping the water by electricity also would vary. In mills generating their own power, the current would cost about $200 a year for pumping 50,000 gallons of water per day, based on 2,880 k w. hours per month. If the current is pur-

Units.	Cost per house on basis 100 installations	Total cost villages with 100 houses.	Cost per house (approximate).	
			Basis 150 houses.	Basis 300 houses.
Sewage Disposal Plant, including sewer mains, sewer connections, and inside plumbing including flush closets	$131.94	$13,194.00	$124.81	$121.25
Water System, including mains, house connections and plumbing, water to be used for flushing closets only	58.21	5,821.00	51.58	44.95
Water System, including mains, house connections, kitchen sinks and plumbing, water to be used for domestic purposes and for flushing closets	68.21	6,821.00	60.58	51.95
Water Tank, Capacity, 50,000 gallons for 100 houses. Capacity, 100,000 gallons for 300 houses	28.47	2,847.00	19.00	
Driven Well, deep, including installation pump and motor to operate same. Capacity, 50,000 gallons, 24 hours	25.00	2,500.00	16.66	
Driven Well, deep, including installation pump and motor to operate same. Capacity, 100,000 gallons, 24 hours.				15.00
Filtration Plant, capacity, 50,000 gallons	20.00	2,000.00	13.33	
Filtration Plant, capacity, 100,000 gallons				10.00
Septic Tank	15.22	1,522.00	10.00	10.00

chased the cost would be greater. The expenses incident to repairs can be kept at a low level by the installation of a non-freezing type of flush closet, by boxing in the water pipes and lining with cotton seed hulls to prevent freezing, and by frequent inspections.

Using these estimates as a standard, we find that a complete sanitary system for a village of average size with 150 installations, including sewage disposal system with septic tank, complete water system supplying water for domestic and for flushing purposes, water tank of 50,000 gallons capacity and driven wells with pump and motor to operate same, would cost approximately $34,677. Interest on this amount at 5 per cent. amounts to $1,733. It may conservatively be estimated that at least 135 of the tenements in such a village would be occupied at all times. Based on a charge of $1.50 per month per house for sanitary conveniences, the income would be $2,430. After deducting the interest charges on the original investment, about $700 still remains to cover maintenance charges

and upkeep. This amount would be amply sufficient provided pumping charges were reasonably low.

In the case of mills located within the corporate limits of cities or towns already provided with water and sewerage systems, the expense incident to the installation of such plants in the mill village proper, would average about $27,808 for villages of 150 houses. The yearly income, based on a charge of $1.50 per month, estimating that 135 houses were occupied continuously, would be $2,430. If water for such a system were purchased from the city or town at a flat rate, it would cost about $1,200 a year. Adding to this the expenses for maintenance and upkeep, which should not be more than $400 per annum, only $830 remains to be credited as interest on the investment (3 per cent.). If to this be added the cost of maintaining a surface or pail system with a scavenger service which would otherwise be necessary, the net income would be 5 per cent.

We are quite convinced that the sewage disposal problem in industrial communities is capable of solution on some such basis as that outlined herein.

It has not been the aim of this paper to discuss in detail the improved health conditions, increased efficiency, and other features which have so frequently been shown to follow efficient sanitary methods. We believe, however, that if health authorities will, in some detail, explain this aspect of the problem to the executive heads of these industries, and can show them, in addition, that a moderate return may be expected on the capital invested, many such executives will not hesitate to install efficient water and sewage disposal plants.

We would also offer the suggestion that health authorities keep closely in touch with corporations contemplating the establishment, in their states, of any industries necessitating the creation of concrete communities, in order that the desirability of installing efficient water and sewerage systems may be brought to their notice. These plants can be installed much more satisfactorily and more economically as part of the original construction than at some subsequent date.

Summary.

1. In Southern rural districts about half the population is without any provision for disposal of excreta. In towns, open surface privies are generally used, in fact even in many cities in which water carriage systems are found. In industrial communities, open surface privies are most usual, water carriage systems rare.

2. Complete water systems and sewage disposal plants can be installed in cotton mill villages at an expense varying from $210 to $265 per house. A rental charge of one to two dollars per house per month for such improvement would suffice to maintain it and also yield a small interest return on the investment.

3. A very considerable benefit to the community as a whole by improved hygienic conditions and to the particular industry through increased efficiency of the workers may confidently be expected as a result of these improvements.

THE FATE OF BACTERIA IN FROZEN MEAT HELD IN COLD STORAGE, AND ITS BEARING ON A BACTERIOLOGICAL STANDARD FOR CONDEMNATION.

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Read before the Laboratory Section, American Public Health Association, Jacksonville, Fla., December 2, 1914.

IN AN earlier paper (AM. JOUR. PUB. HEALTH, Vol. 4, p. 413), the writers reported the results of bacteriological analyses of market hamburg steak; it was found that such steak frequently contains large numbers of bacteria, but at present there exists no bacterial standard for condemning such product. We attempted to find a bacteriological standard equivalent to the organoleptic test, but this proved impracticable. We then proposed an arbitrary bacterial standard for meat and suggested that the limit be placed at 10,000,000 bacteria per gram.

The advantages of a standard are obvious and need not be recounted. Likewise such a standard is apt to carry some disadvantages, and it is only fair that the disadvantages should be considered. It would seem that the refrigeration of meat would interfere seriously in applying a bacteriological standard. It is well known that bacteria die when subjected to low temperatures for long periods of time; accordingly, it would seem that meat which should be condemned by our standard would yet escape condemnation if held in cold storage for a time. The contention may be raised that no standard would condemn meat while frozen, for ammonia and other putrefactive products would not be given off in sufficient quantities. Again, it is not necessary to abandon the organoleptic test simply because we have a bacterial standard. Besides it does not appear to be entirely clear just how refrigeration affects the edibility of products. May it not actually improve a poor product?

EFFECT OF REFRIGERATION ON BACTERIAL CONTENT.

The present investigation was undertaken to determine the extent to which refrigeration interferes with the bacteriological standard. For this purpose, ten samples of hamburg steak were kept in the laboratory until all showed a positive organoleptic test, and also ammonia by Eber's test. The samples were analyzed bacteriologically, then frozen and placed in cold storage at a temperature of -10° C. Periodically, portions were removed and analyzed to determine the changes in bacterial content. The analyses were made with $1\frac{1}{2}$ per cent. agar, $1\frac{1}{2}$ per cent. acid and incubation at 28° C. for five days. To emulsify the meat samples, they were triturated with sterile sand in a sterile mortar as previously described by us (AM. JOUR. PUB. HEALTH, Vol 4, p. 408). Under these conditions the analyses gave the following results:

TABLE I.

GIVING BACTERIAL COUNTS OF SAMPLES OF FROZEN HAMBURG STEAK KEPT AT 10°C.

	July 16, 1913.	July 29, 1913.	Nov. 9, 1913.	Apr. 11, 1914.	July 28, 1914.
1	112,000,000	62,000,000	35,000,000	15,000,000	12,000,000
2	525,000,000	35,000,000	45,000,000	32,000,000	15,000,000
3	127,000,000	51,000,000	16,800,000	11,000,000	5,500,000
4	150,000,000	22,000,000	20,000,000	8,200,000	6,500,000
5	112,500,000	37,500,000	12,400,000	10,000,000	8,000,000
6	112,500,000	28,500,000	10,000,000	8,500,000	6,000,000
7	187,500,000	13,700,000	9,000,000	4,400,000	2,000,000
8	192,500,000	58,000,000	34,600,000	22,000,000	17,000,000
9	382,000,000	43,500,000	37,500,000	16,000,000	10,000,000
10	120,000,000	23,800,000	10,500,000	8,000,000	2,000,000
Average	192,000,000	37,000,000	23,000,000	13,000,000	8,000,000

The table shows that all the samples contained excessively high numbers of bacteria when placed in refrigeration, the average of the ten being 192,000,000 bacteria per gram. At the end of two weeks a tremendous drop occurred, the average now being 37,000,000 per gram; this gives a decrease to one-fifth of the original number. When analyzed after a period of approximately four months, the number had again fallen, but not so markedly, the average now being 23,000,000 per gram. At this time one of the samples would pass the 10,000,000 standard provided it was not thawed out before being placed upon the market.

The samples were again analyzed after the lapse of nine months and this time the average fell to 13,000,000 bacteria per gram; four of the samples would pass our proposed standard. When analyzed after one year, the average fell to 8,000,000 and six of the ten samples would pass the bacterial standard. It would appear, therefore, that the refrigeration of spoiled meats would seriously interfere with the employment of the bacterial standard. All of the samples showed advanced putrefaction when placed in refrigeration. It is obvious that if only questionable samples had been taken for the test, these would easily have passed the standard. It is plain, therefore, that the standard cannot well be applied to frozen meats, except in extreme cases. It is also plain that with the present practice of thawing meats before placing them on sale, the above samples would not evade the bacterial standard very long; indeed, it is doubtful whether they could have passed it at all.

The above consideration naturally suggests the question, what has been the effect of the twelve months' refrigeration upon the condition of the samples with respect to the organoleptic standard? As might be expected,

judgments varied as to whether they should be condemned; there was no question, however, but that their condition had apparently improved. Putrefaction having been arrested, part of the odor escaped, and the samples were pronounced fit for food by one observer. Apparently refrigeration would tend to upset the organoleptic test as well as the bacteriological test.

SUMMARY.

By way of summary, we find:

(1) Samples of hamburg steak which far exceeded our limit for bacterial count and were plainly unfit for food, after one year of refrigeration at $-10°$ C., six of the ten samples would fall within the 10,000,000 standard; they were likewise improved in odor and might even pass the organoleptic test.

(2) If the samples were thawed before placing them on the market, they could not long escape either test.

(3) The bacterial standard compares favorably with the organoleptic test even when applied to meats refrigerated for one year.

EXPERIENCES WITH REFUSE COLLECTION AND DISPOSAL WITH REFERENCE TO ODORS.

SAMUEL A. GREELEY,
Chicago, Ill.

Read before the Sanitary Engineering Section of the American Public Health Association, Jacksonville, Fla., December 2, 1914.

THE question of odors resulting from the collection and disposal of municipal refuse greatly needs the development of public opinion along rational lines. Recently the location of a garbage disposal plant in a large city received much public discussion. A city official in urging the removal of the plant from one location to another argued that the residents near the old location had suffered their share of odors from city garbage. Later, in urging the purchase of a new site, he described in glowing terms the sanitary and odorless plant to be erected there. Unfortunately, the first argument was not forgotten and the plant location was not changed. The matter should have been determined on other grounds as well.

The odor question should be met squarely, with due consideration of the cost of removing the plant to another location and of suppressing the odors altogether. Odors from manured lawns, tanneries, slaughter houses and other industries are tolerated in many places, because they are concerned in the livelihood of many, and cause an inconvenience from odors not commensurate with losses that would follow the loss of the industry. Projects for the location of refuse disposal plants should not be based solely on the odor question, but on the great-

est benefit to the largest number of people at a fair cost.

These comments are not advanced as an argument that odors from the collection and disposal of garbage are necessary or that every reasonable means should not be taken to avoid them. The point at issue is that the presence of relatively small odors should not prevent the carrying out of a needed public improvement on an economical basis. In other words, a fair distinction should be made between odors and a "public nuisance."

In refuse disposal work, odors come chiefly from garbage and quite as often from the collection of garbage as from its disposal. It is entirely feasible to control and suppress odors from the decomposition of garbage to a safe and reasonable minimum.

It should be remembered that unclean garbage wagons will carry their odor all along their route. Such odors are noticeable two to three hundred feet from the wagon. They can be eliminated by the selection of a type of wagon easily cleaned, with a good cover, and by washing the wagon at regular intervals. The European practice is to wash the collection wagons daily. The practice is growing in this country, particularly during the summer months. Washing wagons on alternate days will materially reduce odors but will not eliminate them. With only two washings a week, odors will surely develop in garbage collection wagons in warm weather. Odors in the wagons will be reduced if the garbage is collected at least every other day in the summer months.

Odors from garbage disposal are also subject to control through proper design and operation. The cost for suppressing odors must be judged after due consideration of the character of the neighborhood. The garbage of a city of some 300,000 people is disposed of by burning with coal. The quantity of coal used amounts to about 150 pounds and costs $0.25 per ton of garbage. With this quantity of coal, it is inevitable that odors should at times escape from the chimney top. I have seen a thick brown smoke coming from the chimney. To completely eliminate this condition, would require the use of more coal at an increased cost of disposal per ton, which might amount to $0.15. Yet this plant is considered a success by the people in this city and is widely advertised in that light. There would seem to be no justification for the additional amount of coal and extra cost required, in this instance, to eliminate the odors.

Reduction plants have, in the past, come in for a large share of public criticism because of odors. The balance between the elimination of odors and the cost thereof had not been properly adjusted. This was because many reduction plants were operated by contractors who had no incentive to spend money unproductively to suppress odors. A great deal of improvement has been made during the last few years. A new reduction plant has recently been put into operation at Schenectady, N. Y. This plant is attractively housed and its location is near other buildings and indicates a growing confidence in the possibility of reducing odors from a reduction plant.

The odor question as relates to the workmen at the disposal plant, is not so important as the general cleanliness of the plant and its freedom from dust. Attention to these details will promote odorless operation. Odors, in themselves, are not injurious to health.

In small towns, where the method of disposal may be by burial or feeding to pigs, the odor question will not be so acute. Isolated locations are generally available, where the odors should not be more of a nuisance than those from a farm pig-pen. Odors and nuisance will more often arise from the uncontrolled dumping of garbage in vacant lots near residential districts. I have known odors from such an uncovered dump to carry three-quarters of a mile. The remedy lies in stricter supervision by public officials rather than in large expenditures for improved methods.

The structural details for suppressing odors at refuse disposal works are not within the scope of this discussion. Good construction, however, is essential. Poor construction is an important cause of odors. Incomplete combustion may result from broken grates and cracked furnace walls. These defects are inevitable with bad foundations and poor furnace construction. In reduction works, floors and conveyors should be substantially built with ample provision for washing. Many details of construction, if properly carried out, will materially assist in the elimination of odors. All these matters should be taken up in the design. Both faulty design and construction are difficult to correct later and should be given competent attention in the first place.

Summarizing the effect of odors from the collection and disposal of refuse is largely relative, depending a good deal upon the environment and in particular upon the industrial odors present. Nuisances should, of course, be avoided. But sentimental objections to garbage works are too often raised through a fear of odors of less intensity than a nuisance, and frequently not noticeable at all.

A rational viewpoint has due regard for the cost of suppressing odors and also emphasizes the advantage of good design and construction in the first place, followed by clean and careful operation.

WOUND AND SKIN DIPHTHERIA AS A PUBLIC HEALTH PROBLEM.

LEVERETT DALE BRISTOL, M. D.,
Professor of Bacteriology, University of North Dakota; Director of the State Public Health Laboratories, University, North Dakota.

Read before the Laboratory Section of the American Public Health Association, Jacksonville, Fla., December 4, 1914.

MEDICAL men in general, and public health specialists in particular, have come to believe that diphtheria is one of the few diseases which at present are under fairly satisfactory control. The bacillus which causes the disease is easily recognized. The chief modes of transmission are well understood. By the use of anti-toxin we are able to prevent or to cure a large percentage of cases. Even the important problem of disease "carriers" was first worked out in connection with this infection.

In spite of all this it must be apparent to the close student of preventive medicine that there are many cases of diphtheria which develop without any recognized source.

It is the purpose of this paper (1) to call attention to some of these sources, such as wound and skin diphtheria, (2) to explain how they may be prevented, and (3) to demonstrate a satisfactory treatment of wound diphtheria.

Diphtheria may be properly divided into two classes: 1. Faucial, including the ordinary forms of the disease as they occur in the pharynx and larynx. 2. Extrafaucial, including nasal, vaginal, wound and skin diphtheria.

The first class has attracted most of our attention from public health and therapeutic standpoints. Only during recent years have we come to realize the importance of nasal diphtheria in the spread of the disease and we now take bacteriological cultures from the nose as well as from the throat in all routine examinations.

The existence of wound diphtheria has been known for many years, yet very little attention has been drawn to it from the standpoint of Public Health. Interesting cases have been reported by Paterson,[2] Gerloczy,[3] Schwab,[3] Place,[4] Sowade,[5] and others.[1] Many types of skin diphtheria have been described in the literature. These range from simple eczema-like,[8] or vesicular[9] types, to marked gangrene.[7] From the standpoint of dermatology, Knowles and Frescolm[11] have recently described some of these types of skin diphtheria and have called attention to the danger of this form of diphtheria as a source of infection.

It would seem that the wound or skin diphtheria "carrier" is more dangerous than the ordinary faucial "carrier." The bacilli are on the exposed surfaces of the body in the former class of "carriers" and infection by direct contact, or indirect infection through clothing is made more possible. Wound and skin diphtheria are usually of much longer duration than ordinary diphtheria in the throat. Slater,[9] and

Eddowes and Hare[10] have reported cases of three years' duration. Hence, the serious feature of these cases is that most of them go unrecognized as diphtheria for such a long period. What a fruitful source for countless cases of diphtheria! Evidence is not lacking to show that such cases do serve as sources of infection. Richard[8] describes a patient who had an eczema below her left ear in which diphtheria bacilli were found. Following this her sister developed a typical case of diphtheria.

Baum[12] tells of a discharging sinus of the hip-joint in a boy, from which diphtheria bacilli were isolated. The cultures from the throat were negative but later became positive. This case was followed by a small epidemic (about 19 cases) in the orthopedic ward of the hospital where this boy was being cared for. Several of these children had severe clinical diphtheria.

Engman[13] recalls a case in which a child had recovered from a typical throat diphtheria. Following this an aural discharge developed with some skin eruption about the ear, and from the lesion diphtheria bacilli were cultivated. Another child contracted a fatal diphtheria while playing with this patient before the ear and skin conditions were identified as being due to the Klebs-Löffler bacillus.

On the other hand, open wounds and skin lesions should be protected from cases of throat or nasal diphtheria. Jack[6] describes a case in which a mother contracted a skin diphtheria on the site of a trauma above the left elbow, from her child who had nasal diphtheria.

Knowing these facts, is it not apparent that some concerted effort should be made to require bacteriological examination of all skin lesions, and of suspicious or slowly healing wounds, as an important preventive measure?

A positive diagnosis having been made, rigid quarantine should be established, and proper treatment energetically started.

As an illustration of the necessity for routine bacteriological examinations of all suspicious or slowly healing wounds, as well as an example of successful therapy in wound diphtheria, the following case, which was diagnosed in our laboratory, may be of interest.

Mrs. X, 36 years of age, had suffered for several years with intermittent attacks of "dyspepsia" and abdominal pain which were diagnosed as due to gall stones.

On April 11, 1914, the patient was operated upon and one large stone was removed from the neck of the gall-bladder. Her convalescence was quite normal up to April 15, when her temperature suddenly rose to 103.2° and her pulse-rate increased to 122. At this time there were no signs of increased abdominal distention or pain. A small tube was directed into the abdomen along side of the drainage tube in the gall-bladder, and a very little pus escaped. The following day her temperature was 101° and four days later, April 20, was normal, and remained so with the exception of a slight rise of about one degree every other day. During the next two or three weeks the drainage tract became smaller but did not heal normally.

On several occasions the physician and nurse had remarked on the peculiar appearance of the wound and its extreme slowness in healing.

The patient returned to her home in the country, temperature and pulse being normal. The track of the drainage tube had not healed, however.

Her general condition remained very good for one week after her return home, when she became worse. She seemed to lose considerably in strength and became anemic. The track of the drainage tube was still open and looked inflamed, and was very tender and painful.

About July 1 the patient returned to her physician. She was anemic, unable to walk, and the wound of the drainage tube had become much larger, apparently all the tissues down to the muscles having become involved in a sloughing process which covered an area the size of the palm of the hand. The edges and walls of this wound were very hard and tough. The wound was covered by a greenish-brown membrane which was tough and "leathery." It was very difficult to separate this from the underlying tissue, and any such attempt caused a great deal of pain. For a few days the patient complained of "seeing double" and she developed some paralysis of the arms and legs. Urine examinations at this time showed a large amount of albumin and casts.

A few days after her return the attending surgeon took a culture from the wound, on blood serum, and sent it to our laboratory where a diagnosis of diphtheria was made—a large number of Klebs-Löffler bacilli, associated with staphylococci, being present.

The patient was immediately removed to the Detention Hospital and put under strict quarantine. Although the condition had doubtless existed for many weeks, and the patient was suffering from a more or less chronic diphtheria toxemia, the writer advised the giving of anti-toxin. Two thousand units were injected into the walls of the wound cavity. Following this, the patient's general condition seemed to improve, but the wound remained unchanged with no sign of softening or separation of the membrane. Cultures from the wound remained positive for diphtheria bacilli. During the progress of the disease many antiseptics had been used on the wound, including iodine, strong carbolic acid solution and even a strong solution of nitric acid. These had proven ineffectual in destroying the membrane or in killing the Klebs-Löffler bacilli as is evidenced by the positive cultures that were obtained.

"The Treatment of Diphtheria Carriers" is a subject which has received attention from numerous investigators. Albert[15] has made a very careful study of this subject but unfortunately leaves out of consideration extra-faucial "carriers" with the exception that he emphasizes the possibility of diphtheria bacilli being present in the urine of convalescents.

Knowing of the successful work which had been accomplished by the use of sprays of staphylococci[16] and of lactic acid bacilli[14] in throat diphtheria, we advised the use of the latter organism in this case of wound diphtheria.

Because staphylococci were present with the diphtheria bacilli, it was thought useless to attempt any spray treatment with that organism. The question also arose in our minds why the staphylococci, which were present in the wound, had not inhibited the growth of the Klebs-Löffler bacilli if they really had such a specific effect as has been described by Schiotz[16] and others? This finding of abundant staphylococci along with virulent diphtheria bacilli would seem to lend strength to the opinion of Womer[17] that staphylococcus spray does not materially aid in clearing up throat diphtheria.

Staphylococcus spray has even attained some disrepute because of serious results attending its use.[18] For these reasons it was thought advisable to use a nonpathogenic organism.

The first two days of the treatment, a spray was prepared from lactic acid bacilli tablets dissolved in sterile water. After this, broth cultures of lactic acid bacilli from our own laboratory stock cultures were used. These living bacilli were sprayed on several times a day and a sterile dressing applied over the wound. Care was taken that no antiseptics should be used on the wound during this treatment. About three or four days after the treatment was started, the wound began to lose its tough, leathery appearance, the edges became softened and a greenish-brown liquefied material appeared in the wound. In six days more the membrane was fully liquefied, leaving a clean granulating surface, and the wound cavity was closing up quite satisfactorily. Cultures taken on two different occasions proved negative for Klebs-Löffler bacilli. The wound became entirely healed, but the general condition of the patient did not improve so rapidly. Eventually, however, the toxemia disappeared and the patient fully recovered her health and strength.

This result in the treatment of wound diphtheria confirms the work of Wood[14] and Nicholson and Hogan[19] on the inhibiting effect of lactic acid bacilli on diphtheria, and demonstrates the value of lactic acid bacilli sprays in wound diphtheria as well as in throat diphtheria.

Goltz and Brodie[20] conclude that "Lactic acid bacilli hasten the disappearance of diphtheria membrane, but will not produce cultures negative to the bacillus" in cases of throat diphtheria.

In this case of wound diphtheria not only was the membrane rapidly liquefied, but cultures were rendered negative for diphtheria bacilli.

Summary.

1. Because of the failure to recognize wound and skin diphtheria, and because of its exposed nature and long duration, this form of diphtheria is especially dangerous as a source of the disease in general.

2. All open wounds and skin lesions should be carefully guarded against invasion by Klebs-Löffler bacilli.

3. Routine bacteriological cultures should be taken and examinations made for diphtheria bacilli in all cases of suspicious or slowly healing wounds or skin lesions.

4. In the treatment of a case of

wound diphtheria, sprays of living lactic acid bacilli were of great value in causing the rapid liquefaction of the membrane and the prompt disappearance of the Klebs-Löffler bacilli.

In conclusion the writer wishes to thank Dr. Thomas Mulligan for his kind permission to report this case, and for valuable records and information supplied.

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A PROPOSED AMERICAN PUBLIC HEALTH ASSOCIATION COURSE OF STUDY FOR HEALTH OFFICIALS AND OTHERS INTERESTED IN PUBLIC HEALTH WORK.

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New York City.

Read before the General Session of the American Public Health Association, Jacksonville, Fla., December 4, 1915.

THERE has been for many years a feeling among some members of this Association that its opportunities for usefulness, not only to its own members, but, to a large extent, to the communities from which its membership is recruited, were not fully realized and developed. An annual meeting, with a concentrated pabulum of scientific knowledge and experience, spread out later in small monthly courses in the JOURNAL, is very good so far as it goes, but it certainly is not utilizing to the greatest advantage the organization which has been built up. It is not the purpose of this paper to point out all the lines of usefulness which could be developed by this Association. They are undoubtedly many, and some of these have been pointed out by others and more may develop in the course of this meeting. It is my purpose simply to make a suggestion for one line of activity, which I am prompted to do from having observed a similar line of activity in another organization with which I have been privileged to be associated. In April of 1913, the suggestion I am about to make was taken up with one of the officers of this Association with a view to presenting it at the Colorado meeting. The idea was favored, but other things crowded in and prevented the writing of the paper in time for that meeting. Early this fall the suggestion was made to the secretary of this organization, who also approved of it, and this paper is the result, therefore, of that correspondence. These facts are mentioned simply to indicate that the idea antedated some other suggestions of like character which have been made this year, and free me of any charge of plagiarism.

There is in the United States an organization known as the Associated Advertising Clubs of America, which has been in existence for some ten or twelve years and which numbers in its membership some ten thousand or more individuals, represented by some one hundred and thirty-five clubs in various parts of the United States and Canada. This organization, like our own, has an annual meeting at which many papers are read, later to be printed—usually in abstract form—in the journal of that association. But this association of advertising men has not been satisfied to let its work rest with an annual meeting and the publication of a journal. Some years ago it felt there should be some work of benefit to its membership carried

on through the year, which would keep the interest in the organization stimulated. Two important phases of work in which advertising men are interested were started by the appointment of appropriate committees, respectively known as the Vigilance Committee and the Educational Committee. These committees represent movements that are being carried out in the local clubs by similar committees. The work of the Vigilance Committee, with which this paper is not particularly concerned, may be summed up, briefly, as a censorship over advertising to prevent the publication of false and misleading statements in advertising, or the advertising of products in themselves fraudulent or harmful. Some time it might be worth while for this Association to interest itself in the work of the Vigilance Committee of the Associated Advertising Clubs of America or with the work of the vigilance committees of local advertising clubs in the cities scattered over the United States and Canada. The possibilities of using this powerful organization for the elimination of fraudulent patent remedies and quackery generally, should be a matter that would interest public health men.

It is the work of the Educational Committee, however, that appeals to the writer at the present time as a possible line of work for this Association. Briefly, the purpose of the Educational Committee of the Associated Advertising Clubs of America—which is generally spoken of as the National Educational Committee in contra-distinction to the educational committees of the local advertising clubs—is to promulgate courses of study in the various phases of advertising work, that in turn will be taken up by the clubs or the individuals in the clubs and studied with a view to perfecting the members in the principles and practices of advertising. An educational committee in this Association would have similar purposes in the public health field, but would have to work with the individuals directly, as of course there are no such things as public health clubs.

It is well understood, I think, that the great majority of the men in public health work enter it untrained. There used to be a feeling that the position of health officer or health commissioner of a community must be held by a physician as he was supposed to be the only person who understood health problems. The members of this Association, however, pretty generally recognize that a certificate granting the degree of doctor of medicine to the individual therein named does not, of necessity, qualify such a person for the position of health officer. In many small communities men have been forced into the position of being responsibile for the public health simply because of their knowledge of medicine and because no other physician has been available or willing to take the place. Many of these men are conscientious, anxious to do what is right, and to administer the office with a view to prevention of disease and the general up-building of the health of the community. When problems are brought to them, or problems which, through emergency, have to be solved at once, they are

at a loss to know what to do or what the general practice is in the combating of the difficulties in which they find themselves. Many of these men would undoubtedly be glad to have an opportunity to study the methods and practices of those who have had larger and more extended experience in this field of work, and to be able, when emergencies arise, to turn to a compilation of these methods and practices which have been tried and which have more or less been proven in the crucible of necessity. To a certain extent this Association has already made a start along this line. The work of the standard committees for various laboratory methods and practices has established itself as authoritative throughout this continent. It is the purpose of this paper to suggest that this work be extended so that the entire field of public health practice be covered, and that standards of practical methods of dealing with all the phases of public health work which are likely to arise in any community be established and promulgated so that those interested in public health work, either as officials or otherwise, could always turn to this Association for authoritative advice and direction in the handling of such problems.

How best to accomplish this purpose should undoubtedly be left to the combined wisdom and experience of a committee of this Association. Possibly, however, it could be worked out somewhat on the lines of the Educational Committee already referred to, appointed by the Associated Advertising Clubs of America. This committee works through nine sub-committees, the names and functions of which are, as the writer understands them, briefly as follows:

1. Committee on Publications.—This committee is charged with the duty of publishing the lectures, text-books, and such other educational matter as is written directly for the use of the Educational Committee or designed for part of its campaign.

2. Committee on Study Courses.—This committee is charged with the preparation of the lectures, the courses of study, and similar work.

3. Committee on Small Town Club Work.—On this committee devolves the work of stimulating the local clubs in small towns to take the educational courses and to do educational work. In some of these clubs they have local educational committees and the work is carried on through the chairman of the local committee.

4. Committee on Schools and Y. M. C. A.'s.—This committee is charged with the responsibility of having schools and the educational departments in Y. M. C. A.'s offer courses in the study of various phases of advertising, sometimes using the lectures prepared by the National Educational Committee and sometimes calling on local talent to give courses of lectures. In most of the large cities in the United States the Y. M. C. A.'s have heartily coöperated in this work and most of those having educational departments have courses in advertising. Many schools are becoming interested, particularly those that have a leaning towards preparation for commercial work.

5. Committee on Libraries.—This

committee is designed to see that public libraries throughout the country procure such standard books on advertising rules and practices as will enable a student to procure suitable reading matter in addition to the lectures which he will get through the regular courses of study promulgated by the Educational Committee. It is also intended to stimulate local clubs, where they are of sufficient size and maintain their own clubhouses, to establish such reference libraries. In the city of Newark, New Jersey, there has been established a Business Men's branch of the Public Library, which, I understand, is the first departure of this kind in this country.

6. Committee on Research.—This committee makes a study of business conditions, studies the types of advertising that are successful and determines why they are successful, and the types of advertising that failed and why they failed. This is all very valuable information to the progressive advertising man and undoubtedly enables many to steer away from dangerous and unprofitable practices.

7. Committee on Lectures.—In addition to the regular course of study, there are general lectures prepared, illustrated, many times, with lantern slides, which are sent out to the various clubs to be delivered by some local member before the entire club membership. This committee is charged with the preparation of these lectures and with their distribution to the local clubs.

8. Committee on Colleges and Universities.—This committee is similar in many respects to the Committee on Schools and Y. M. C. A.'s, excepting that it devotes its energies to the higher institutions of learning.

9. Committee on Educating the Public.—This is a new departure in the work of the Educational Committee and its work is not developed to the extent of being able to say definitely how the committee proceeds in its education of the public.

It will be obvious that committees similar to many of those above named could be utilized in the work of an education committee of the American Public Health Association. The work would be, of course, somewhat different and some of the committees would not be necessary. The naming of them here is not intended as a suggested form of organization for any committee that may be appointed by this Association, but simply as indicating the organization of a committee doing successful work in another large association and for such assistance as that may give to the committee charged with the organization of educational work in this Association. Of course it is impossible to go into the detailed work of these various committees in the scope of this paper.

It is obvious, I think, that the preparation of courses of study indicating the best practice in the various lines of public health work would presently become very valuable as a work of reference. It has seemed to the writer that as such courses of study are completed, they could be compiled in book form and issued as works of reference and become a revenue-producing asset of the Association, as have the reports of the Standard Committees

on Water Analysis, Milk Analysis, etc. It is also obvious, I think, that it would be an extremely valuable thing to have a committee, which might correspond to the Committee on Libraries of the Advertising Association, compile a bibliography of works on public health problems, segregated under the various phases of public health work, which would be of very great value indeed to students of public health problems or to those in public health practice.

In the September 4, 1914, issue of *Public Health Reports* is an article by Assistant Surgeon-General John W. Trask, of the United States Public Health Service, suggesting very much the same idea as it is the purpose of this paper to suggest. The fundamental difference is that he proposes that this work be carried on by the secretaries of the state boards of health. If the suggestion were taken up by the executive officers of the state and provincial boards of health in each of the several states in this country and of the other countries interested in this Association, there would be as many different methods of dealing with the problems suggested as there are numbers of states or provinces. If, on the other hand, this work could be carried on by a committee of this Association, composed, possibly, to a large extent of the secretaries of state or provincial boards of health, a more or less uniform practice could be suggested for the entire territory represented in this Association and a wasteful duplication of effort avoided. The committee, no doubt, could in this way avail itself of the experts of the various state and provincial boards of health, and there is probably little reason to doubt that the federal governments would be glad to coöperate in this work by authorizing their experts to coöperate with this committee.

There is, as the members of this Association know, a growing amount of attention being paid to the subject of educating men for public health work in many of our large universities. This is very commendable and needs our encouragement. The educational work suggested by this paper is not intended to conflict or compete with the very excellent work these institutions are doing, but to supplement it by providing the fundamentals of the science to those not trained in universities and by giving the results of practical experience to those who have had the training.

Neither is it intended that the suggested committee take up, for the present at least, any educational work for the general public. Some very excellent work of this character is being done by health departments in our large cities and by some state departments. No doubt such work could be profitably done at some future time by some committee of this Association.

The writer hopes that this suggestion contains the germ of an idea which will commend itself to the approval of this Association.

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Vice-Chairman, Prof. H. W. Conn, Middletown, Conn.	Vice-Chairman, Dr. W. A. Plecker, Richmond, Va.	Vice-Chairman, Dr. W. S. Rankin, Raleigh, N. C.
Secretary, Dr. D. L. Harris, St. Louis, Mo.	Secretary, Dr. Louis I. Dublin, New York City.	Secretary, Dr. E. C. Levy, Richmond, Va.
Recorder, Dr. A. W. Freeman, Richmond, Va.		Recorder, Dr. A. S. Fell, Trenton, N. J.

Sanitary Engineering	Sociological	Industrial Hygiene
Chairman, Dr. Geo. W. Fuller, New York City.	Chairman, Dr. H. E. Dearholt, Milwaukee, Wis.	Chairman, Dr. George M. Kober, Washington, D. C.
Vice-Chairman, Prof. G.C.Whipple, New York City.	Vice-Chairman, Dr. L. K. Frankel, New York City.	Vice-Chairman, Dr. Alice Hamilton, Chicago, Ill.
Secretary, Dr. H. D. Pease, New York City.	Secretary, Dr. W. F. Snow, New York City.	Secretary, Dr. E. R. Hayhurst, Columbus, O.

DISEASE AND DISASTER.

The feeling of apathy with which the public regards the thousands of deaths that annually occur as a result of preventable disease, contrasted with the excited comment which is indulged in when some catastrophe of an unusual and somewhat spectacular character obliterates a number of lives in a moment, is the subject of the following timely statement in a recent bulletin of the Cincinnati Health Department.

"In the storm that struck this city last week, one family lost five, and another six of its members. The city was appalled at these tragedies, and for years to come many citizens will view with apprehension every sign of an approaching storm.

"The high wind, darkness, rainfall, lightn'ng, thunder and falling buildings formed a stage setting that lacked nothing in its appeal to man's feelings of terror and utter helplessness.

"The knowledge that beneath the ruins lay the bodies of helpless men, women and little children aroused a feeling of infinite pity and spurred to titanic efforts those engaged in the work of rescue.

"The ten hearses carrying the bodies to the church and then to the cemetery furnished a picture that will never fade from the memories of those who saw it, its appeal to the imagination being tremendous and overpowering.

"During every week of the year an average of sixteen deaths occur in other scattered portions of the city. These are due to disease that is preventable. Their occurrence causes no great wave of sympathy to sweep over the municipality and calls for but a brief line in the daily press in the way of comment. Many of them represent years of suffering, and, if full histories could be obtained, would doubtlessly reveal tragedies so gruesome that the storm's toll, by comparison, would almost seem like an act of mercy."

The Chicago excursion steamer disaster, because of the larger number of victims, is a more striking illustration of the same point. In the Chicago case the deaths of the people who were on the steamer *Eastland* might have been prevented, yet many people who are horrified and even stunned by this accident, would calmly read the vital statistics for the city of Chicago without giving a second thought to the infant mortality or the tuberculosis death-rate or the number of persons who annually succumb to cancer.

The health department and a small number of citizens are left to fight the horror of preventable death from disease, but, when an accident simultaneously brings grief to a few score homes, the whole city, even the whole country, is stirred to an expression of grief and indignation.

This is the darker side — there are, however, many instances that bring joy and encouragement to the small army that is fighting for the things that mean a healthier race and a happier one. Tuberculosis is not gaining on us, infant mortality and the general death-rate are being reduced, typhoid fever, if we compare the present situation with its prevalence some years ago, is greatly diminished and a pandemic like those that visited Europe in the Middle Ages has surely become an impossibility in the United States.

ACCIDENTS FOLLOWING VACCINATION.

W. F. Elgin,
Glenolden, Pa.

Read before the General Sessions, American Public Health Association, Jacksonville, Fla., December 4, 1914.

THIS study is suggested because of the increasing difficulty in securing compliance with school requirements in reference to vaccination, due to the activity of anti-vaccinationists in exaggerating both the number and character of these unfortunate accidents.

Cancer, consumption, typhoid fever, ulcerated stomach, leprosy, diphtheria, syphilis and many other diseases have been charged to vaccination, but these require no discussion here. Several cases of cerebro-spinal meningitis have been reported as following vaccination, but here again no causal relation has been established. Septicemia in various forms, due to invasion of pathogenic organisms at some stage of the vaccinal process from accident or carelessness is occasionally noted.

Recently a Philadelphia court awarded a negro $5,000 damages for the loss of a leg, said to be due to septicemia, following vaccination by a city physician in 1910. Carelessness was alleged. The verdict, however, has been set aside by a higher court.

A case is now pending in Chestertown, Md., where the commissioners are sued for $10,000 for the death of a negro child through alleged carelessness in vaccination by the county physician.

Recently, three cases of anterior poliomyelitis following vaccination in from ten to twenty days, have been reported from New York State. So far as is known, these children did not come in contact with each other or with other cases of poliomyeltis, so that the parents naturally concluded that vaccination was at least a factor in some way.

While cases of the classes enumerated are a drawback to enforcing vaccination, they are insignificant as compared with tetanus, and it is in a study of this disease in its relation to vaccination that we are chiefly interested.

I have been able to secure more or less complete histories of 82 cases occurring in the United States and Canada since 1899. Some of these, prior to 1902, were discussed by Wilson,* and are taken from his paper; some more recent Philadelphia cases are taken from Wadsworth's† report of coroner's cases and from records of the coroner's court. I wish here to express to Doctor Wadsworth my appreciation of his assistance in securing copies of these records.

First analyzing these somewhat in detail we note the following facts.

Case 1. Pushed against door by playmate at school. Scab torn off. Tetanus developed in 24 hours.

Case 2. Large, deep ulcer present 20 days after vaccination. Arm dirty.

*An analysis of fifty-two cases of tetanus following vaccination with reference to source of infection. Journal of A. M. A., 5/3/02.

†Records of cases of tetanus in Philadelphia during recent years by Dr. Wm. S. Wadsworth. From the Transactions of the College of Physicians of Philadelphia, 1913.

Case 3. Dirty, sloughing ulcer. Child in poor health.

Case 4. Deep ulcer present.

Case 5. Sore about 1½ inches in diameter filled with pus; partly covered with a dirty bandage.

Case 7. Deep ulcer present.

Case 8. Dressed at time of vaccination with cotton wadding from an old quilt. Scab knocked off.

Case 9. Scab torn off arm; sleeve and arm both dirty at time tetanus developed.

Case 10. Large ulcer present. Arm and sleeve filthy.

Case 13. Bad, sloughing sore.

Case 14. Large suppurating ulcer, exposed to clothing and atmosphere.

Case 15. Deep ulcer in the arm, covered with a greenish matter.

Case 16. Large suppurating ulcer, which the doctor believes was infected by the finger nails of the child scratching it.

Case 17. Dressed by mother; dirty dressing retained for days. *Recovery.*

Case 18. Child wore shield and "dirt got under it."

Case 19. Shield left in place for over three weeks; large, deep, ulcer present; dressed with flaxseed poultice and rag bandage.

Case 20. Large ulcer; scab removed and dressed at home. Child assisted in taking up potted plants. Cultures from earth near her home showed tetanus bacilli.

Case 22. Scab torn off; ulcer dressed at home; tetanus organisms in soil near child's residence.

Case 23. Celluloid shield fastened with adhesive strips; not removed for 28 days. Child slept with father who had charge of the horses in the stable on floor below.

Case 24. Shield not removed for 21 days. Filled with discharge.

Case 25. Child's father was coachman and had charge of horses in stable on floor below. Child slept with father; vaccinated on the leg; ulcer size of a quarter.

Case 26. Bunion plaster used as shield.

Case 27. Dressed by mother; dirty dressing retained for days. *Recovery.*

Case 28. Bunion plaster applied when vaccinated.

Case 29. Muslin shield used; had not been removed and pus was escaping from shield.

Case 30. Child attended masquerade with wound exposed to red calico domino.

Case 31. Severe ulcer. Threw bandages on ground and then replaced them on the arm.

Case 32. Linen shield was used; had not been removed when tetanus set in.

Case 33. Muslin shield was used; ulcer about the size of a half dollar; later no covering used; lint from shirt ulcerated into wound.

Case 34. Ulcer about 1 x ¾ of an inch.

Case 35. Shield was removed in one week; ulcer about the size of a quarter.

Case 36. Vaccinated by a druggist.

Case 37. Surface to be vaccinated not washed; child played in lumber yard near horses.

Case 39. Patient frequently at work shoveling the dirt in yard. Dirt rich in tetanus bacilli; scratched with finger nails.

Case 40. Shield not removed for 22

days; filled with excretion which was running down the child's arm.

Case 41. Arm poulticed with plantain leaves, then with cow manure.

Case 42. Shield was filled with pus without changing for days; scab lost on 22d day and rag worn from that time.

Case 43. Vaccinated by policeman; severe ulcer; rag dressing; unclean surroundings.

Cases 45–6–7–8. Insane patients in the Philadelphia Hospital; filthy habits.

Case 49. Deep ulcer.

Case 53. Improperly cared for arm.

Case 54. Vaccinated on farm where a horse, cow and calf had previously died of tetanus.

Case 55. Played in yard; wound opened twice by falls.

Case 56. Physician's child; father believes case of secondary infection.

Case 59. Scab knocked off in school yard; onset of tetanus eight days later.

Case 60. A blow on arm October 4th; tetanus developed, followed by death on October 9th.

Case 62. Vaccine wound infected by scratching.

Case 65. Played about stable.

Case 71. Infected on farm.

Case 73. Sores on finger and ear.

Case 74. Subsequently ran splinter in the hand, which later became infected.

Case 75. Dressed with lettuce leaves once or twice daily.

Case 77. Blow received on the arm ten days after vaccination.

Case 78. Underclothing stuck to the sore.

Thus we note that out of 82 cases, we have histories of 54 showing possibilities of subsequent infection of the vaccination wound; such as an improperly used shield, dirty dressings, traumatism, etc.; and a more or less intimate association with stables in several instances.

A further investigation shows that the disease was much longer in developing after vaccination than the usual incubation period of tetanus.

Developing within one week, 2.... 2½ per cent.
Developing in from one to two weeks, 4..... 4¾ per cent.
Developing in from two to three weeks, 34 ..... 41½ per cent.
Developing in from three to four weeks, 17 ..... 20¾ per cent.
Developing in over four weeks, 6.. 7¼ per cent.

All but four of these cases resulted in death; whereas in the 200 cases of tetanus reported by Andrews and Morgan in which the incubation period was fourteen days or over, 77 died; a mortality of only 38½ per cent. This would indicate that the infection was subsequent to vaccination. A further inspection of our list shows that of the 47 cases in which we have been able to obtain the number of days from the onset of tetanus to death, we find that 24, or slightly over 50 per cent. died in 48 hours, while 42, or something over 95 per cent. died within seven days.

Andrews and Morgan* in their table of 252 cases originally investigated show only 27 cases with an incubation period of over 14 days and of this number 19, or something over 70 per cent. recovered; while the average period between onset and death of the remaining eight was 6⅛ days.

* Tetanus. A preliminary report of a statistical study by James M. Andrews, M. D., LL. D., and Arthur C. Morgan, M. D., Philadelphia, Pa., Journal A. M. A. July 29, 1905.

CHART 1.

	Location.	Date of vaccination.	Date of onset of tetanus.	No. of days between vaccination and onset.	Date of death.	No. of days between onset and death.	Reported by
1.	Columbus, Ohio	1899		3 wk.			
2.	Cleveland, Ohio	1/3/99	1/24	21 da.	1/26	2	
3.	Omaha, Nebraska	1899			2/11		
4.	Brewster, N. Y.	Oct. '99		21 da.			Wilson
5.	Chicago, Ill.	10/3/99	10/16	13 da.	10/30	14	
6.	St. Louis, Mo.				12/23		
7.	St. Louis, Mo.	1900			10/8		
8.	Paris, Tenn.	11/27/00		3 wk.	Death		Wilson
9.	Kalamazoo, Mich.	1/3/01	1/27	24 da.	2/1	5	Wilson
10.	Cleveland, Ohio	1/3/01	1/24	21 da.	1/26	2	
11.	Chester, Pa.	5/25/01			7/1		
12.	Cleveland, Ohio	5/25/01	6/15	21 da.	6/19	4	
13.	Cleveland, Ohio	6/5/01	6/25	20 da.	7/4	19	
14.	Philadelphia, Pa.	6/7/01	6/27	20 da.	6/29	1½	Wilson
15.	Cleveland, Ohio	6/16/01	7/15	29 da.	7/20	5	
16.	Philadelphia, Pa.	9/5/01	9/19	14 da.	9/24	5	
17.	Massachusetts	9/10/01	9/10	21 da.	*Recov.*		Wilson
18.	Spring City, Pa.				9/19		
19.	Camden, N. J.	10/1/01		7 wk.		7	Wilson
20.	Burlington, Vt.	10/2/01	10/21	19 da.	Death	2	Wilson
21.	Camden, N. J.	Fall '01					Wilson
22.	Burlington, Vt.	Oct. '01		21 da.	Death		Wilson
23.	Philadelphia, Pa.	10/9/01	11/6	28 da.	11/8	1½	Wilson
24.	Camden, N. J.	10/14/01	11/8	25 da.	11/15	7	Wilson
25.	Philadelphia, Pa.	10/14/01	11/4	21 da.	11/8	4	
26.	Camden, N. J.	10/15/01?	11/1	17 da.			
27.	Atlantic City, N. J.	10/18/01	11/8	21 da.			
28.	Camden, N. J.	10/19/01	11/4	16 da.			
29.	Camden, N. J.	10/19/01	11/6	18 da.	11/8	2	
30.	Philadelphia, Pa.	10/19/01	11/10	22 da.	12/1	9	Wilson
31.	Bristol, Pa.	10/19/01	11/10	22 da.	11/12	2	Wilson
32.	Camden, N. J.	10/21/01	11/11	21 da.	11/14	3	
33.	Camden, N. J.	10/23/01?	11/11	19 da.	11/13	2	
34.	Atlantic City, N. J.	10/23/01	11/13	21 da.			
35.	Camden, N. J.	10/25/01?	11/15	21 da.			
36.	Nova Scotia, Can.	10/25/01	11/18	24 da.			
37.	Philadelphia, Pa.	10/26/01	11/13	18 da.	*Recov.*		Wilson
38.	Camden, N. J.	10/26/01					
39.	Philadelphia, Pa.	10/27/01	11/11	16 da.	11/21	5	Wilson
40.	Atlantic City, N. J.	10/28/01	11/16	19 da.			

CHART 1.—*Continued.*

	Location.	Date of vaccination.	Date of onset of tetanus.	No. of days between vaccination and onset.	Date of death.	No. of days between onset and death.	Reported by.
41.	Merchantville, N. J.	10/28/01					
42.	Bristol, Pa.	11/3/01	11/24	21 da.	11/27	3	Wilson
43.	Brighton, N. J.	11/4/01	11/27	23 da.	12/2	5	Wilson
44.	Camden, N. J.	11/4/01	11/25	21 da.	11/27	1½	Wilson
45.	Philadelphia, Pa.	11/8/01	11/27	19 da.	11/30	3	Hughes
46.	Philadelphia, Pa.	11/11/01	12/1	23 da.	12/16	15	Hughes
47.	Philadelphia, Pa.	11/18/01	11/25	7 da.	11/26	1	Hughes
48.	Philadelphia, Pa.	12/9/01	12/30	21 da.	*Recov.*		
49.	Montreal, Canada	9/7/06	9/26	19 da.			
50.	San Francisco, Cal.	7/27/09	8/21	25 da.	8/26	1	
51.	Philadelphia, Pa.	8/20/09	9/17	28 da.	9/19	2	Wadsworth
52.	Bethlehem, Pa.	8/28/09?	10/14	47 da.	10/15	1	
53.	Hartford, Conn.	10/2/09	10/23	21 da.	10/25	2	
54.	W. Summerville, Mass.	1909			10/22		
55.	Philadelphia, Pa.	9/6/09	9/13	37 da.	9/15	2	Wadsworth
56.	Philadelphia, Pa.	9/9/09	10/5	26 da.	10/10	5	Wadsworth
57.	Lancaster, Pa.	8/7/10			10/23		Dr. Miller
58.	Lancaster, Pa.	8/24/10			10/9		Dr. Miller
59.	Philadelphia, Pa.	9/7/10	10/1	24 da.	10/5	4	Wadsworth
60.	St. Louis, Mo.	9/20/10			10/9		
61.	Philadelphia, Pa.	9/21/10	10/13	22 da.	10/16	3	Wadsworth
62.	St. Louis, Mo.	10/4/10	10/16	12 da.	10/17	1	
63.	St. Louis, Mo.	10/25/10					
64.	Philadelphia, Pa.	10/26/10	11/13	18 da.	11/15	2	Wadsworth
65.	Philadelphia, Pa.	11/5/10			12/4		Wadsworth
66.	Worrell Park, Md.	1911					
67.	Mt. Winans, Md.	1911					
68.	York Road, Md.	1911					
69.	Annapolis, Md.	1911			10/2		
70.	Philadelphia, Pa.	8/5/11	10/12	58 da.	10/14	2	Wadsworth
71.	Philadelphia, Pa.	8/28/11	9/22	25 da.	9/24	2	Wadsworth
72.	Philadelphia, Pa.	9/5/11			9/20		Wadsworth
73.	Philadelphia, Pa.	7/17/12	8/17	31 da.	8/21	4	Wadsworth
74.	Philadelphia, Pa.	9/1/12	9/16	15 da.	9/17	1	Wadsworth
75.	Philadelphia, Pa.	5/2/13	5/21	19 da.	5/22	1	Wadsworth
76.	Philadelphia, Pa.	5/14/13	6/2	19 da.	6/3	1	Wadsworth
77.	Philadelphia, Pa.	9/2/13	9/22	20 da.	9/24	2	Wadsworth
78.	Philadelphia, Pa.	9/8/13	9/22	14 da.	9/24	2	Wadsworth
79.	Gloversville, N. Y.	7/26/14	8/24	29 da.	8/27	3	
80.	Gloversville, N. Y.	8/11/14	9/6	26 da.	9/11	5	
81.	White Plain, N. J.	8/17/14	9/14	28 da.	*Recov.*		
82.	Aurora, N. Y.	8/24/14	9/9	16 da.	9/18	9	

This again would indicate infection subsequent to the vaccination.

The geographical distribution of these cases seems worthy of consideration. Of the 82 cases, 34 are from Pennsylvania, 16 from New Jersey, 6 from Ohio and 5 from New York; with the balance, 21, scattered over 9 other states and Canada. This in a measure conforms to a list of Andrews and Morgan of 1,099 cases of tetanus from all causes; Pennsylvania leading with 224 cases and the four states of Pennsylvania, Ohio, New York and New Jersey contributing 515 or nearly one half the total number reported by them in the United States.

Some critics have suggested that if tetanus following vaccination is simply a secondary infection, why are not more cases of tetanus reported as resulting from open wounds present at all times in large cities. In order to show that this disease does occur in localities where tetanus is known to be present in the dust, I will call attention to Doctor Wadsworth's article taken from the coroner's records of Philadelphia as follows:

1909	
Total virus distributed by health department	40,400
Total cases of tetanus investigated	25
Post vaccinal	3
1910	
Total virus distributed by health department	65,000
Total cases of tetanus reported	30
Post vaccinal	4
1911	
Total virus distributed by health department	44,183
Total cases of tetanus reported	24
Post vaccinal	3
1912	
Total virus distributed by health department	40,844
Total cases of tetanus reported	4
Post vaccinal	2

In these four years, the city distributed 190,427 vaccinations and Doctor Wadsworth estimates that private firms sold at least double this amount, making more than half a million vaccinations in the city. Tetanus followed in only 13 cases, while there were 90 cases of tetanus having no relation to vaccination. This would seem to demonstrate that certainly most cases of post-vaccinal tetanus can be accounted for in the same way as tetanus following any other wound presenting proper conditions for the reception and development of tetanus spores.

I will not take up your time in discussing the possibility of contaminated virus but will only call attention to the fact that if it were possible for tetanus bacilli to escape detection when the virus is subjected to the rigid tests required by the Public Health Service, Doctor Francis'* recent work seems to indicate that the number of organisms must be so few that no harm could result. This is in line with Carini's† earlier work in which he detected tetanus bacilli five times in 400 experiments with 50 difficult lymphs. He states: "The presence of so small a number of tetanus germs forms no particular danger." and that "Some of the particular specimens of lymph in which we could demonstrate tetanus spores were used in thousands of inoculations without any complications resulting therefrom, whatever. Experi-

* Hygienic Laboratory.—Bulletin No. 95.

† Doctor Carini, formerly Chief of Vaccine Department, Bourne, Switzerland.

mentally it is only when the organism is present in numbers so large that they could be easily detected by cultural tests that we may fear the development of tetanus through contaminated virus."

I have thus far attempted to show that in the majority of post-vaccinal tetanus cases the evidence indicated late infection. But admitting this to be true, what can be done in the way of prevention? I would give the following suggestions:

1. The proper cleansing of the operation field.

2. Make proper scarification; short linear incision according to Dock's* method.

3. Instruction of the patient or parents as to after treatment. The vaccinator to examine the vaccination weekly or more often if necessary until the patient is well.

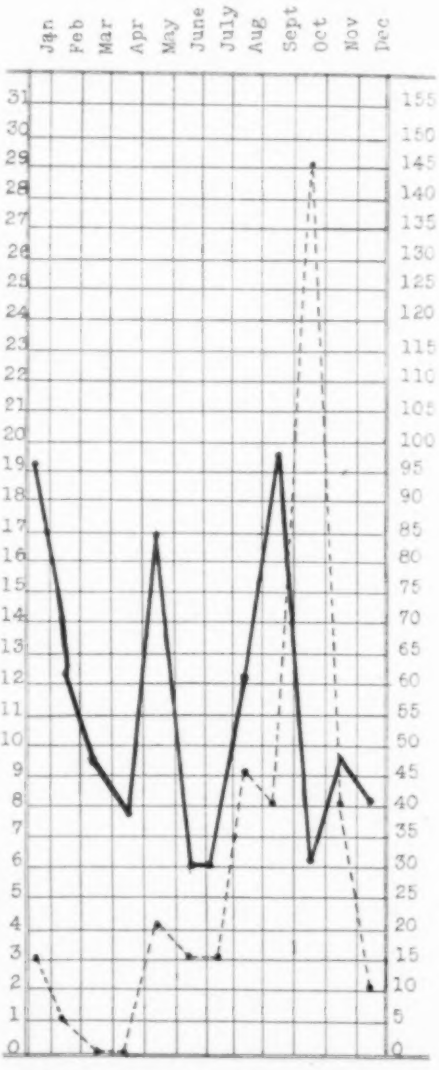
4. On evidence of infection of any kind, treat *promptly* as an infected wound, without regard to the vaccination.

5. Instruct the patient or parents as to the possibilities from neglect of these instructions.

6. Vaccinate only in the winter or spring unless smallpox is present. The emphasizing of this point is the most important object of this study.

In 77 of these cases, the date of onset of tetanus is known, and of this number, 29 developed tetanus in October, 15 in September, 10 in August and 8 in November. The other eight months of the year show a total of 15 cases with none in March or April.

CASES FROM POST-VACCINAL TETANUS COMPARED WITH OUTPUT OF VIRUS.



The black line indicates the average output of virus for the month.

The dotted line indicates the number of cases of post-vaccinal tetanus cases during the same month.

*George Dock A. M., M. D. Simple incisions for vaccinations. Therapeutic notes, Nov., 1906.

To summarize, therefore, over 80 per cent. of these cases occurred in the late summer and the three fall months. You would probably expect this because of the school vaccinations at this time, considering that this would represent the largest total vaccinations in the year. This, however is not the case. For 15 years, I have noted the output of vaccine from the laboratory is usually heavier in the winter than during the school vaccination period. A reference to the chart shows the number of cases of tetanus by months as compared with the output of virus for corresponding periods during the years 1912–1913–1914.

It will be noted that a large proportion of the tetanus cases develop in the fall, while large amounts of virus are also distributed in winter and spring with small case rate for tetanus. Does this not indicate that weather conditions, dust, etc., are more favorable to the development of tetanus in the summer and fall than at other times?

In conclusion, therefore, I cannot too strongly recommend that health officers and others responsible for the vaccination of school children insist on a change in the time when this operation is performed, as a routine procedure.

Résumé.

1. Tetanus is the most important complication of vaccination.

2. The evidence indicates that infection is, in a large majority of cases, post vaccinal.

3. It may be largely prevented (1) by proper care of the vaccinal wound and (2) by requiring certificates of vaccination from school children in the winter or spring rather than in the fall as at present.

THE PROTECTION AND MAINTENANCE OF THE PUBLIC HEALTH DURING AND SUBSEQUENT TO A GREAT CONFLAGRATION.

WILLIAM C. HANSON, M. D.,
State Department of Health, Boston, Mass.

Read before the General Session of The American Public Health Association, Jacksonville, Fla., Dec. 4, 1914.

DURING the night of June 25, 1914, several thousand people in Salem, a sea-coast city of Massachusetts were made homeless by a fire. The burned area included a large manufacturing community. The entire burned area covered a mile in length from west to east and a varying width from a few hundred feet to more than half a mile. The population previous to the fire was about 40,000.

On the day following the fire, the city was placed under martial law.

On the morning of this day the Governor of the Commonwealth handed to me the following document:

> TO WHOM IT MAY CONCERN:
>
> This is to certify that William C. Hanson, M. D. has been instructed by me to represent the Massachusetts Board of Health at Salem, and I desire full authority to be given him to go to any section of the city and to do any work that he may deem necessary to safeguard the public health of the city of Salem.
>
> [Signed] DAVID I. WALSH. *Governor.*

This made it mandatory for the public health authorities to work with, not against, the military forces. The first step in importance, therefore, was to find out immediately the most effective way of assisting the militia.

The State Board of Health had made preparations for the emergency. On the night of the fire we realized that a portion of our force would be called upon to assist the militia to maintain the health of the fire-stricken community. There must be a pure water supply and a system of sewerage, not only for the military camps but for the refugees. Then, too, special precautions must be taken as to the protection of food supplies and a careful watch made over the prevalence of communicable diseases.

Methods of action were clearly mapped out and members of our health district officials were in readiness to pull together in such ways as might appear desirable.

There was no stir or commotion on our part, but a definite preparedness of action. In the course of usual activities, we had developed well-defined methods of sanitation, and all that was needed was to put these methods into immediate effect, although, to be sure, under more or less trying conditions.

The State Board of Health, therefore, recognized the fact that the entire sanitary problem must be dealt with by two big forces, (1) a body of military surgeons, working under strict military discipline, and (2) a corps of officials trained in municipal and state health work.

In other words, the problem was a double one—of military and civilian sanitation.

The one big leader or general, at the time of a great fire, is obviously the governor of the state, the commander-in-chief of the army. As would be expected, he looked upon the adjutant-general of the militia and some responsible official of the State Board of Health to get together and join their forces. The governor, therefore, summoned us in consultation. This constituted the first official step taken.

Whether in military or civilian sanitation, discipline is an essential requisite for success. Discipline among our health officials had long since become second nature to them. They had been accustomed to teamwork. To pull together, therefore, in the interest of so great a cause as that of maintaining the health of this fire-stricken community did not seem to them a duty, but a pleasure.

Our officials knew that not only must the health of the civilians be protected, but that of the troops, in order that the troops might be kept in the best condition for their work and not spread disease to the civilians.

Thus the problem became less difficult because there was but one aim in view—to cause the maintenance of the health of both troops and civilians.

The best way of maintaining the health of the troops and civilians was by means of military discipline, and, as the city was placed under martial law, it was the only way.

The first requisite, therefore, at the time of a great conflagration, is military discipline and efficiency in health work.

The highest standard of military discipline and efficiency can be attained only through the joined forces of military and civilian officials under the command of one responsible and efficient head in charge of each force, both of whom are directly responsible to the commander-in-chief of the militia—the governor of the state.

So thoroughly in harmony did the officials of the State Board of Health and the militia act that no time was lost in discussion. Important and effective results were attained through prompt decisions and a keen appreciation of each other's viewpoints, training and position.

The experiences resulting from such harmonious action between the military and civilian health officials lead me to suggest that public health officials not now familiar with the military training and discipline of the state militia in camp sanitation, lose no time in acquiring such practical knowledge. I believe it to be a fundamental necessity for the most effective protection and maintenance of the public health during and subsequent to a great conflagration.

You perhaps noted the word "maintenance" in the title of my paper "The Protection and Maintenance of the Public Health During and Subsequent To A Great Conflagration." It is indeed not enough at the time of a great conflagration to cope with unusual and atypical conditions tending to break down the health of the community; the every-day problems must be dealt with. If anything, exceptional pains should be taken to observe the commonplace, or seemingly trivial, objectionable conditions, in

order to remedy them promptly before any such assumes larger proportions and becomes associated with an outbreak of disease. To act as if the common sanitary standard of maintaining health in a community will answer the purpose of the stricken community is to fail to grasp the situation with all its dangers. Too strict sanitation is scarcely possible. The city must have a thorough cleaning and must be kept clean until living conditions again become normal. Moreover, the highest practicable standard of civilian sanitation is in keeping with the military standard.

The second requisite, then, at the time of a great conflagration, is a common high standard of sanitary efficiency for both troops and civilians.

In one of the military camps, where about 2,000 people were under canvas, there were on duty three medical officers, two medical sergeants, fifteen enlisted men of the medical corps and from eighteen to twenty civilian helpers, who had direct charge of the medical and sanitary work. In addition to these officers, two companies of the militia furnished the necessary guards for the company's streets, hospital, kitchens, latrines, and grounds. Each medical officer had two orderlies in constant attention while he circulated about the camp all day long, making the refugees keep the tents in order and use the latrines instead of their own tents. The other enlisted men either with or without a non-commissioned officer, had charge of the civilian helpers and of the policing of the grounds. The people were quickly trained to keep their tents in proper order. One man, who refused to keep his tent in order, was arrested by the guard on duty, who, in turn, sent for a civilian policeman, with the result that the man served thirty days in jail.

Outside the tents equally good sanitation was demanded. The city was divided into several sections with a medical officer of health at the head of each section. This official was held responsible for a careful sanitary inspection of his territory. The information thus gained was used at once, and effectively. In this work the state and local health officials coöperated in their usual manner, but to an exceptional degree of efficiency. House to house inspections were made to detect cases of communicable diseases, bad housing conditions and possible sources of illness. Extraordinary efforts were made to cover all exposed human excreta and other sources of fly-breeding material.

In order to prevent the occurrence of typhoid fever and disentery, a vigorous anti-fly campaign was instituted. We emphasized the need of screening all foodstuffs and of placing fly traps in the homes, bakeries, stables, restaurants, or any places were food was kept or sold.

A map of the burned area was prepared on the day following the fire. An epidemiological map was prepared daily and every communicable disease investigated, including in addition to the usual "notifiable" diseases, diarrhœa, tonsilitis, sore throat, acute bronchitis, bronchopneumonia and pneumonia.

Numerous analyses of the city water

supply were made and all reasonable steps taken to overcome promptly any threatened dangers of disease.

The milk supply was carefully watched and no milk-borne disease occurred on any dairy farm in the towns and cities from which raw milk was shipped into the city. Whenever any dairy conditions were discovered to be incompatible with the production of wholesome milk, the local authorities were notified in order that the necessary steps could be taken to exclude the milk from the city. While the pasteurization of all raw milk delivered into the city was recommended by the State Board of Health, the local authorities did not insist upon it but did advise the citizens to boil the milk. All milk supplied to the camps was pasteurized.

Similarly, anti-typhoid vaccine was only insisted upon in the militia, but the public were given an opportunity to be vaccinated as a protection against typhoid fever.

All the tuberculosis patients, whose homes had burned, were accommodated in tents in a desirable locality and well cared for.

Perhaps the most useful, single act of coöperation between the State Board of Health and the militia was that of constructing a temporary sewerage system at the more permanent of the two military camps. By order of the adjutant-general, pipes were laid without delay and the necessary latrines constructed. This work was done by the city authorities.

Not a single case of typhoid fever was reported or discovered during, or for some weeks following the fire. A few cases of scarlet fever and other infectious diseases were detected and effectively quarantined, but the city was relatively free from such diseases long after the militia were removed and civilian rule established.

The entire set of experiences disclosed the usefulness and importance of discipline in preventive health work.

The work of the City Board of Health was noticeably strengthened by the military discipline practiced.

Moreover, the simple but effective methods of the military officers of teaching sanitation to the uninformed proved of great service in bringing about safer living conditions, not only in the military camps, but in surrounding places and towns,—and at a trivial expense.

A BACTERIOLOGICAL METHOD FOR DETERMINING MANURAL POLLUTION OF MILK.

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Read before the Laboratory Section of the American Public Health Association, Jacksonville, Fla., December, 1914.

THERE are many factors in milk production regarding which the sanitarian desires information, but after eliminating that of disease in the dairy, the determination of the extent of manural pollution becomes the most important.

Our bacteriological methods of analysis are aimed quite largely at this factor, and yet at the present time it must be admitted that the object is not satisfactorily attained. The number of bacteria present is dependent upon the age of the milk and the temperature under which it is held, quite as much as upon manural pollution.

The curd test is aimed more directly at manural pollution, but the results are difficult for the sanitarian to interpret. The writers are not aware that it is used at all extensively except in the control of milk in cheese-making.

The determination of the number of B. coli present in the milk indicates more directly the degree of manural pollution, and this determination is now a routine procedure in some laboratories. However, the method has certain obvious disadvantages: (1) It is somewhat complicated and time-consuming and therefore relatively expensive. It is doubtful whether the information gained is worth the price. (2) The organism multiplies in milk at ordinary temperatures; hence if the milk has stood some time, which is usually the case, the test becomes quite useless as an indicator of the extent of pollution. (3) A more serious objection still is the increasing use of pasteurized milk; the pasteurizing process kills the B. coli and hence the method fails completely with this class of milk which comprises the major portion of the supply in some of our larger cities, and is destined to still greater increase. It would seem therefore, that the B. coli test will become limited to certified milk, if it is not abandoned altogether.

Recently the mechanical filter has been employed to detect gross dirt in milk, which is usually manure. The method has apparently proven a most valuable asset to the sanitarian, partly because of the ease of application, and partly because of the tell-tale nature of the evidence afforded by it. Probably the producer will meet this method with more careful filtration, and if the milk is run through a centifrugal clarifier, it must fail altogether. It would seem that the method is destined to a limited usefulness.

In searching for a bacteriological method for determining manural pollution, one that would obviate the disadvantages of the B. coli determination, it occurred to us to make use of B. sporogenes as an indicator. The idea was suggested by the fact that

English bacteriologists to some extent use B. sporogenes as an indicator of sewage pollution in water. Since the organism is a spore-producer and goes over into the spore stage under ordinary temperatures, it is plain that it cannot be entirely killed out by pasteurization, therefore, the manural pollution of pasteurized milk may be determined. Nor would centrifugation eliminate it from the milk. Consequently, the method comes nearer being a universal one than any heretofore proposed, granted that a relation can be established between the numbers found and the degree of manural pollution. The following work was carried out with a view to establishing this relation if possible.

Methods of Determining B. Sporogenes.

We first employed the method suggested by Savage, viz., heating 10 cc. of milk in a test-tube in the Arnold for 10 minutes at 80° C., then forcing down the cotton plug, pyrogaltic acid and alkali are added above, the tube is stoppered and incubated for 24 hours at 37°C. The casein should show a characteristic shredding. While this reaction is quite typical for a pure culture, it is commonly masked when other spore bacteria such as B. vulgaris are present. This method was therefore abandoned.

The Smith fermentation tube was next employed, the 10 cc. of milk being added to lactose liver broth, heated as before, and incubated. If sporogenes is present, gas is formed and the odor is quite characteristic. With this method, satisfactory results were obtained and part of our data were secured while using it.

Later another method suggested itself, one which proved to be simpler and cheaper as well. The handling of the fermentation tubes proved awkward and their cleansing is a task. Instead of fermentation tubes we used plain test-tubes, the liver broth was omitted altogether, the milk sample taking its place. To secure aërobosis sufficient sterile paraffin was added to the tube to make a layer one-eighth of an inch or more in thickness. The tube containing the sample of milk and some paraffin was heated to 80°C. for 10 minutes, cooled, and incubated. If the sporogenes was present the lactose was digested under the anaërobic conditions and the gas formed raised the paraffin plug some distance up the tube. If vulgaris was present, digestion without gas formation ensued. The method was so simple, easy, cheap and rapid that we adopted it for all later work. The suggestion that it be used in determining B. sporogenes in water analysis is scarcely necessary.

The Number of B. Sporogenes in Cow Manure.

Having found a satisfactory method for determining B. sporogenes, it became desirable to determine the extent of its presence in cow manure in order to estimate the extent of pollution in milk. Since our method did not permit us to determine the number directly, we resorted to the scheme employed in finding B. coli in water, viz., finding its limits in a series of fermentation tubes.

The manure which varied from fresh to several days old was added to milk in various dilutions. The results are summarized in Table I.

TABLE I.

SHOWING THE APPROXIMATE NUMBER OF B. SPOROGENES IN MANURE.

Dilution	No. of samples analyzed.	No. positive for sporogenes.	Per cent. positive.	Probable No. of sporogenes per gram.
1:1,000	56	41	73.2	730
1:5,000	54	27	50.0	2,500
1:10,000	54	20	37.0	3,700
1:50,000	14	4	28.5	14,300

It is evident from the table that B. sporogenes is present in manure in greatly varying numbers. There may be present less than 730 or more than 14,300 per gram. The samples contained approximately 83½ per cent. moisture as shown by drying at 100°C. Since the manure that finds its way into the milk supply is usually quite dry, it is safe to say that the probable number per gram is at least four times as high as the table indicates. If we allow for probable loss of water, we would have 10,000 sporogenes as the probable average number per gram of manure as it enters the milk. Undoubtedly this figure will be greatly changed when more extensive data are available but it will serve our purpose for presenting the general contention.

The question naturally arose whether B. coli shows greater constancy than B. sporogenes in cow manure. Accordingly sixteen samples were analyzed in the same manner as before, with the results shown in Table II.

From this limited number of analyses the variation would appear to be even greater than for sporogenes, and there is no loss in accuracy when the latter is taken as a measure of pollution.

TABLE II.

SHOWING THE APPROXIMATE NUMBER OF B. COLI IN MANURE.

Dilution.	No. of samples analyzed.	No. positive for B. coli.	Per cent. positive.	Probable No. of B. coli. per gram.
1:10,000	16	13	81.2	8,120
1:100,000	16	11	68.7	68,700
1:1,000,000	16	7	43.7	437,000

take the results for the 1:5,000 dilution as giving the best average, since exactly 50 per cent. showed more than 2,500 per gram and 50 per cent. showed less, and multiply this number by four to

The Number of B. Sporogenes in Market Milks.

It became necessary to apply our method of analysis to market milks. After a considerable number of trials, we decided to use 5, 10 and 15 cc. samples for testing each sample of milk. The results are summarized in Table III.

TABLE III.

GIVING THE NUMBER OF B. SPOROGENES IN MARKET MILK.

Milk used.	No. of samples analyzed.	No. positive for B. sporogenes.	Per cent. positive.	Probable No. of sporogenes per litre.
5 cc.	90	25	28	55
10 cc.	112	42	37.5	37
15 cc.	34	17	50	33

Previous analyses have shown that cow manure under the conditions of our test probably contains about 10,000 B. sporogenes bacteria per gram. If now we assume this figure as a working average, then 10 sporogenes indicate 1 milligram of manure. If this organism is present in 5 cc. of milk but not in 10 cc., then there would be at least 10 in a 50 cc. sample; therefore, 50 cc. samples contain 1 milligram of manure. Fifty litres would contain 1 gram of manure. Its presence in 10 cc. samples only, means that 100 litres contain 1 gram of manure. Likewise if present in 15 cc. only, then 150 litres of milk contain 1 gram of manure.

We have arbitrarily assumed that 1 gram of manure in 50 litres of milk is excessive; that not more than 1 gram in 100 litres is fair milk; and that not more than 1 gram in 150 litres represents good market milk. On this basis our analyses may be tabulated as shown in Table IV.

TABLE IV.

SHOWING AMOUNT OF MANURE IN MARKET MILK USING B. SPOROGENES AS AN INDICATOR.

Sample of milk.	No. samples analyzed.	Per cent. showing B. sporogenes.	Presence of B. sporogenes equivalent to 1 gram manure in:
5 cc.	98	25	50 litres
10 cc.	78	54	100 litres
15 cc.	34	50	150 litres

According to the standard assumed, 25 per cent. of the market milk as represented by the samples analyzed, showed the equivalent of 1 gram of manure per 50 litres of milk. We make no contention for this particular standard for it must be adjusted to

suit the local demands. We do contend, however, that the method seems to afford a valuable means of checking up manural pollution.

If B. sporogenes indicates manural pollution, then certified milk should not show the presence of this organism. Thirty-seven samples were tested but unfortunately only 5, and 10 cc. samples were taken. In no instance was sporogenes found. The contrast is as striking as are the methods employed in the two processes of production.

The crucial test of the method comes in applying it to pasteurized milk; if it fails here, then we are probably no better off than before with only the B. coli test. From an analysis of 110 samples we obtained the results shown in Table V.

TABLE V.

SHOWING THE B. SPOROGENES IN PASTEURIZED MILK.

Sample of milk.	No. of samples.	No. showing B. sporogenes.	Per cent. positive.
5 cc.	110	20	18
10 cc.	110	63	57

Comparing these results with those for unpasteurized milk, it is seen that B. sporogenes is prevalent in about the same proportions in 10 cc. samples, the percentages being 57 and 54 respectively. That it is less prevalent in 5 cc. samples is probably due to the mixing process. It is clear, however, that the method is applicable to pasteurized milk, and this is its strongest point.

Relative to the question whether B. sporogenes increases in numbers in stored milk, only a few tests were made, but these tended to indicate that no increase took place. From the nature of the organism which has its optimum at 37° C., it seems fair to assume that no increase occurs.

Summary.

The investigation would seem to show that the use of B. sporogenes as an indicator of manural pollution in milk possesses decided advantages over the B. coli test in as much as the method of analysis is much simpler and expeditious; further, it can be employed on all classes of milks including even pasteurized, where the B. coli test is manifestly worthless. It can also be applied to centrifugalized or clarified milks where the sediment filter test becomes useless. The method apparently possess a greater general applicability than any heretofore proposed.

A NOTE ON UHLENHUTHS METHOD FOR SPUTUM EXAMINATION, FOR TUBERCLE BACILLI.

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Read before the Laboratory Section, American Public Health Association, Jacksonville, Fla., December 4, 1914.

THE writer, in 1909, made a preliminary verbal report to the Laboratory Section of the Public Health Association, on Uhlenhuths method for detecting tubercle bacilli in sputum. Since that time until now this method with some important modifications has been employed in the daily routine examination of sputum sent to the laboratory. Now since it has been so satisfactory for rapid and accurate results, and in view of the fact that this method has not been adopted, to the extent I believe it should, it is deemed now of sufficient importance to make a further report somewhat in detail, how it is best employed. Before doing this I wish to disavow any claim for originality of this method, for all credit belongs to Uhlenhuth and his co-workers, and the so-called "Kinyoun method," as it has been referred to by some of my friends, is a misnomer. The only thing which I can lay claim to is to make the method practical for the routine examinations.

The original method consisted of dissolving the sputum in an alkaline solution of hypochlorites of soda (this requiring several hours) and the centrifugalizing the specimen to throw down the bacilli, after which the fluid was poured off, sediment examined. Later, ligroin was added to the digested sputum, which was shaken to mix the ligroin, then the sputum was placed in a water bath and raised to 60°C. By this means the bacilli will rise to the surface together with a layer of detritus, in which the bacilli will be found.

These procedures required several hours, and therefore would handicap a laboratory in getting a prompt report to the physician, which is important. Notwithstanding these drawbacks, the method had such good points, that it was too good to abandon, so I began to experiment with it with a view of overcoming the objections, and soon found how this could be done. In the first place, the digestion of the sputum by the alkaline hypochlorites can be done rapidly, provided the sputum be shaken vigorously for a few minutes. This is best accomplished in a Ricard's Sputum Shaker. The other point is that ligroin can be added to the sputum together with the alkaline hypochlorites without interfering in anyway with the digestion.

The sputum is sent to the laboratory of the Health Department in a wide mouth, square shouldered, bottle of 5 cc. capacity, which takes a No. 10 cork. Each bottle, when sent out, contains 2 cc. of a 1 per cent. solution of compound Cresol (or Lysol) which is placed therein to prevent decomposi-

tion of the sputum before it reaches the laboratory.

The routine which is followed is: On the receipt of the sputum, one cc. of ligroin of a specific gravity of 0.715 is added and sufficient amount of the alkaline solution of the hypochlorites to fill the bottle to the shoulder; this may vary according to the content of the bottle. In case the bottle is full, the same must be poured out, usually about one-third, and then filled as above indicated.

It is then placed in the sputum shaker and vigorously shaken from five to ten minutes, then placed over in the centrifuge which has buckets made to receive the bottles, and centrifuged for ten minutes at moderate speed. The centrifugalization brings the ligroin to the top and a soap-like layer of detritus just under this. The tubercle bacilli will be found in this layer. A platinum loop of the soapy material is spread on a slide and dried fixed by heat or by methyl alcohol and stained for the tubercle bacillus. The ligroin should have a specific gravity from 0.715 to 0.720, this gives much better results than any below or above these points. The action of the ligroin seems to be two-fold; it combines in some way with the waxy envelope of the bacillus, thereby making it lighter, and lubricating it. Another advantage is that there is a tendency for the bacilli to clump, on centrifugalization; where the bacilli are few this is a decided advantage.

Efficiency: I have found that with this method that there is an increase of 19 per cent. of the positive specimens, others have found from 14 to 16 per cent. increase, these latter were based on a larger number than mine.

It is not only more accurate, but is a great time-saver, the number of specimens which one can examine by this method as compared with the old, is at least ten times as many, and with little or no eye strain. The time required to examine a specimen under the microscope is not more than one minute. If after a search of one minute you do not find the bacilli, it is useless to search longer.

Tissues and other substances suspected of being tuberculous, such as pus, blood and feces, can also be digested and examined for the bacilli, but the solvent action is somewhat slower than for sputum. Tissues should be ground with sand or powdered glass to a moderately fine pulp, then the alkaline hypochlorites and ligroin is added to the mass, shaken and centrifugalized. Pus and blood are to be treated in the same manner as sputum.

Feces should be treated in the following manner. If solid, a small amount of water is added and shaken to break up the lumps, then a small quantity of this is placed in a container, to which the alkaline hypochlorites and ligroin are added. This is again shaken and then centrifugalized. Feces, as a rule, contains but very little albuminous matter, unless blood or pus be present, therefore, it does not adhere to the slide, so in order to overcome this, it is best to fix the specimen to the slide, by methyl alcohol, or a small amount of egg white, or horse serum, as the case may be.

It has no advantage over other

methods for detecting tubercle bacilli in urine. This method has its advantages, and disadvantages, it is not at all satisfactory for milk, it does not digest the butter-fat, at all, and acts very slowly on the casein. Even were it satisfactory, I question its value because there are frequently found in milk acid-fast bacilli, which are not tubercle. The specimen does not adhere strongly to the slide as is the case with untreated sputum, so frequently there is a tendency for some of the film to become detached, sometimes, nearly all, when not properly fixed, and will be washed off. So it is necessary to prepare one specimen to a slide rather than several on a single slide, as is sometimes done. Fixation of the specimen is best done by methyl alcohol, but heat is very satisfactory provided it is a little longer than for the untreated sputum.

The method which I have found to be satisfactory for preparing and staining a specimen of sputum is as follows: Specimens are prepared on individual slides. Two lines are drawn across the slide with a wax pencil, allowing a space of about ¾ inch between them. A loop of the soapy layer is spread on the slide between the wax lines, and allowed to dry, then fixed by heat or methyl alcohol. Carbol-fuchsin is added until the space between the wax lines is covered. These wax lines confine the carbol-fuchsin to the space and prevents it from running over the slide, moreover, there are occasionally specimens, which are refractory to the stain, which will run off unless so confined. The staining is made at ordinary temperature and in from one to three minutes, heat is not necessary although is not contra indicated.

Decolorization is best accomplished by a 3 per cent. solution of hydrochloric acid in 95 per cent. alcohol, and stained with Löefflers methylene blue for contrast. Gabbetts decolorizing solution does not work well particularly when the film is thick or unevenly spread. The carbol-fuchsin solution which is employed for cold staining is one which I have been using for the past 20 years, and differs somewhat from the Zeihl-Neilsen. It is:

Fuchsin basic	4 grams.
Acid carbolic (Cryst. Merck)	8 grams.
Alcohol 95 per cent.	20 cc.
Water	100 cc.

Filter.

The solution of the alkaline hypochlorites is practically the Liquor Sodæ Chlorinæ, U. S. P., of a double strength to which is added 7½ grams of caustic soda to each 100 cc. The amount of chlorine is important and should be from 5½ to 6 per cent. Any percentage less than this is not so effective, and below 3 per cent. is of no value.

The solvent action depends on the amount of available chlorine, and of the percentage given. A larger amount of available chlorine does not seem to hasten the digestion, nor an increase of the free alkali, but on the other hand interferes with the staining quality of the bacilli. This solution is fairly stable, it lasts from 2 to 3 months without much deterioration.

The commercial article known as "Antiformin" has not given as satisfactory results as could be desired, several lots were tried out, and all ap-

peared about the same strength. The amount of available chlorine was much below 6 per cent. So on comparing a home-made article with this, the trouble was found to be in the chlorine content. Since then all the alkaline hypochlorites have been prepared in the laboratory. It is rather tedious to prepare, although not difficult.

The prerequisite is a good fresh chlorinated lime which has at least 30 per cent. available chlorine. Ten pounds or 4,500 grams of lime are placed in a covered stone or glass jar and sufficient water is added until it is a thick mush. Three thousand two hundred and fifty grams of washing soda is put in a stew pan and sufficient water, about 2,500 cc. is added to bring the soda in solution, when boiled. While boiling add this to the lime and stir it well when adding. Allow this to stand for 4 to 6 days, stirring it well each day. Then filter and estimate the amount of available chlorine. If above 6 per cent. add sufficient water to dilute it to this amount. Then add $7\frac{1}{2}$ grams of caustic soda to each 100 cc. and filter.

If the chlorine content is high, a liter of water can be added to the lime residue and filtered off. Sometimes 2 to 3 exhaustions can be made, before the chlorine content falls below 6 per cent.

The hypochlorite solution can also be made by passing chlorine gas through a 50 per cent. solution of caustic soda, than after ascertaining the amount of chlorine, add $7\frac{1}{2}$ grams of caustic soda. Unless large quantities are required, this method is not available.

The alkaline hypobromates also digest sputum, but its action is somewhat slower, but it does not interfere with the staining quality of the tubercle bacillus.

A method for preparing it, which I have found to be good, is to take an Erlenmeyer flask of 1,000, to 1,500 cc. capacity, and pour into it about 100 cc. of water, then pour in from 5 to 10 cc. of bromine. The water will prevent escape of the gas and the flask will confine almost all the gas set free in the pouring. Small quantities of a stock solution of 50 per cent. caustic soda are added until all the bromine is conbined, and a bright greenish yellow fluid results. This can now be tested for the amount of available bromine and diluted to $7\frac{1}{2}$ per cent. when 5 grams of chloride of lime (not the hypochlorite) or chalk are added, to each 100 cc., together with 15 cc. of the 5 per cent. solution of caustic soda, then it is filtered and ready for use.

The addition of a lime salt is essential, for unless lime be present, the unsoluble soapy layer will not form, and although the bacilli are brought to the top, with the ligroin, the preparations are fixed with difficulty and are more liable to wash off during the process of staining.

The same may also be said with regard to making the hypochlorites from chlorine gas, here the addition of a lime salt is necessary just as for the hypobromites.

BUREAUS OF WATER SUPPLIES.

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Address of Chairman Laboratory Section, American Public Health Association, Jacksonville, Fla. December 1, 1914.

THE United States government and the state governments should maintain special bureaus for the investigation and control of water supplies. The United States government bureau must of course control the purity of water in interstate streams and the quality of water furnished by common carriers in interstate traffic. The state bureaus must control the purity of water in streams and ponds within the respective states and must control the quality of water furnished by the various municipalities and even must control private supplies of the citizens in the state. The bureaus must have more than mere routine control laboratories. They must be ready with staff and equipment to make investigations of methods of analysis to determine standards of purity or to make any other investigations on which the routine tests may be based or by which results of analyses may be interpreted.

The development of water supply control has been comparatively slow for it has been the custom, apparently for administrative reasons, to place the control of water supplies in a bureau or department having other duties. It has been very natural to place the control of water supplies in the health department; for no one cares to deny that the health of the water consumer is of the greatest importance and therefore that the control of the purity of water used for drinking purposes is the most important duty of a water bureau. In practically all of the states, therefore, where any control of the water supplies is attempted, it is done by a bureau or department that is a division of the board of health. Among the many duties that must be performed by a board of health the work of the water bureau or division is very often considered of minor importance. If no specific appropriation is made by the legislature, and if those in charge of the general bureau have insufficient funds to perform all of their duties, the work of the water laboratory is usually neglected.

We wish to emphasize our belief that the federal and state water bureaus must be given more liberal support and especially more extensive powers than is the custom. The powers must be broad enough to include the duties of two extremes of routine laboratory work, at the one extreme the duties of a laboratory which under the control of a health officer is merely an adjunct to the health department or merely performs routine work to determine the quality of drinking water; and at the other extreme those duties performed by a railroad laboratory under

the control of an engineer, who is interested only in saving money by obtaining a satisfactory boiler water and who often entirely neglects the quality of water furnished to passengers for drinking. Further the laboratory or bureau must be given freedom to make any scientific investigations that have connection with water problems. It must have freedom to investigate or develop new methods of analysis, new methods of water purification, and new methods for the purification of sewage or trade wastes, whenever and wherever these may be proposed. Health, comfort and convenience is dependent on the quality of water and the bureau must be prepared to deal with hygienic, æsthetic and economic water problems.

The laboratory for the investigation and control of water supplies should include divisions of chemistry, biology, bacteriology statistics and engineering. The bureau may be in charge of a physician, a chemist, a biologist, a bacteriologist, a statistician, or an engineer, but in any case a man should be chosen who will be broad minded enough to understand the necessity for the investigation of all water problems.

A review of the progress of water supply control for the past thirty years shows that the most marked progress has been accomplished through the efforts of bureaus which have been almost if not quite independent. The state of Massachusetts, for example, made a specific appropriation for the control of the water supplies of Massachusetts and the work of this laboratory has been epoch making. The city of New York has apparently given the directors of Mt. Prospect laboratory a free hand for the publications from this laboratory have helped greatly to advance the science of water supplies. Special studies at Columbus, Ohio, and at the experiment station of the Sanitary District of Chicago are noteworthy. Large cities like Cincinnati and Louisville have conducted special investigations in connection with the establishment of purification plants. These investigations have been important factors in extending our knowledge of water supplies and water treatment. The continuation of the laboratories, in these cities under the direction of specialists after the completion of the purification plants has also been an important factor in extending our knowledge of routine control of water purification.

It is a bad plan to assign the examination of the quality of water to one department and the furnishing of a sufficient quantity of water to another. We have heard of cities where it is the duty of the engineering department to furnish the water and the duty of the health department to determine its quality. The engineering department considers only the necessity of obtaining a sufficient supply and deems it an interference when the analyses by the health department show that the water supply is of impure quality. The health department considers only results obtained in routine examinations, condemns the water and is unable to offer a remedy that will assist the engineering department to obtain pure water. Without coöperation, under such conditions the water remains impure indefinitely, perhaps

until a serious epidemic arouses the citizens and compels the authorities to purify the water. It is surely desirable to have a bureau or department of water supplies whose sole business it shall be to furnish an abundant supply of pure water.

The larger cities can of course easily maintain a special bureau of water supply. It is, however, practically impossible for smaller towns, individually, to defray the necessary expenses of an efficient water supply bureau. Several small cities may unite to maintain a bureau of water supplies or each state may maintain a bureau. This community or state bureau should have the coöperation of every municipality within its area. To enumerate some of the duties of the state bureau: The state bureau must collect accurate statistics concerning the quantity and quality of the water supplied to all the citizens of the state in order that corrective measures may be applied where necessary. It should have the power to compel cities to employ competent engineering assistants to properly plan new water supplies. Each city should make the necessary routine chemical and bacteriological tests to control the quality of water and each city having a purification plant should carry on simple daily control tests in order that the water supply may be ever pure. The state laboratory should know that these tests are properly carried out either under its own direction or under the direction of competent consulting sanitarians.

Owing to the fact that the economic features of any problem appeal to the general public, the state bureau should take control not only of the quality of the water from the hygienic standpoint but also from the economic standpoint. Experiments that will be of general interest should be carried on to determine the best methods of softening water, the best methods of preventing scaling, corrosion and foaming in boilers, the best methods of treating water for special manufacturing uses and the best methods of treating and utilizing trade wastes. While such experiments are not directly the function of a health department, whenever the water bureau is in the department of health, executive health officers should promote their solution. The solution of economic problems will render it more easy to obtain funds for the solution of the hygienic problems.

State bureaus have necessarily a limited influence. There should be a permanent national bureau of water supplies which can coöperate with all the state bureaus. As the state bureau should be a clearing house for community bureaus, the federal bureau should serve as a clearing house for coöperative work to be carried on by the various state bureaus. It may be claimed that the general government can deal only with interstate problems. The interstate problems are very important and will become more so as the population of the country becomes greater. The investigations of the condition of the Potomac and Ohio Rivers carried on under the direction of the Hygienic Laboratory of the United States Public Health Service are examples of what can be done. Let us hope that the laboratory estab-

lished at Cincinnati may be continued after the present investigation of Ohio River is completed in order that a record may be kept from year to year of the condition of the river.

The federal bureau should maintain an experimental laboratory in which studies could be made of problems which are of interest to two or more states. In order to properly enforce the rulings of the Treasury Department with regard to standards of water for interstate carriers, the Hygienic Laboratory or a federal bureau, should have examinations made by its own agents throughout the whole country. The United States government should maintain a central laboratory and division laboratories, similar to those maintained by the Department of Agriculture for the enforcement of the pure food laws, a central laboratory in Washington and branch laboratories throughout the country. As a beginning the laboratory fitted up at Cincinnati, Ohio, for the study of the conditions of the Ohio River can be made a permanent division laboratory and similar laboratories can be installed wherever necessary to promptly and efficiently obtain the requisite knowledge of the condition of water served on interstate carriers, and to enforce the regulations made by the department. Such an arrangement should be welcomed by the various state organizations.

Coöperation of the federal bureaus with the state organizations and both with city or community organizations will bring about more efficient control of the purity of all our water supplies resulting in the improvement of the comfort and health of all our citizens.

DANGER TO LAUNDRY WORKERS OF INFECTION FROM THE HANDLING OF SOILED LINEN.

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DOES THE "MIXED WASHING" IMPERIL PUBLIC HEALTH?

THE possibility of dissemination of disease through laundries was suggested by the fact that bed linen and body linen of different customers are washed together, though usually in separate compartments in the same rotary washer, and in steam laundries doing the washing for the so-called hand laundries the clothes are packed in coarse mesh bags—"nets"—and washed without being removed from the bag.

The manager of one of the most up-to-date laundries, a former bacteriologist and chemist, undertook the following experiment in order to determine the possibility of infection through "mixed washing." Sterilized clothing was placed in a "net" with clothing contaminated with gonorrheal discharges. After the "net" had been subjected to the ordinary washing process it was found that one third of the previously sterile clothing was contaminated with gonococci.

This experiment, while interesting, is without value in that no cultures were made to determine whether the organisms had been killed in the washing process. The question has been studied by bacteriologists here and in Europe. Wurts and Tanon have made the following tests to determine the bactericidal effect of the ordinary washing process. Strips of muslin, soaked in virulent cultures of typhoid, dysentery, colon, anthrax, and cholera bacilli, streptococci and staphylococci, were put through the ordinary washing process. No growth was obtained, showing that none of the germs survived. In soiled body linen and bed linen the microörganisms are protected by the albuminous substances in the secretions and discharges containing them. The tests were therefore repeated with strips of muslin dipped into a solution of albumin before being soaked in the respective cultures. The results were again negative. Martin of the Pasteur Institute in Paris also concluded that linen is sterilized in the washing process.

It is possible that the contaminated discharges are mechanically removed by the first rinsing which *precedes* the actual washing, and this theory is supported by its enormously high bacteria content (Miguel, *Revue d'hygiene*, VIII, 1886, p. 388), one to two millions of pathogenic organisms to each cubic centimeter.

The sterilizing action of the washing process is due, in the order of their importance, to the high temperature to which the clothes are subjected, soap and washing soda, other chemicals.

Heat.—The maximum temperature of the wash water varies from 110° C.

to 160° C. in different laundries. The average maximum temperature is 150° C. The drying rooms and "hot air tumblers" are heated to 140° C. to 180° C. The mangles are heated by steam under pressure of from 3 to 6 kgm. (135°–160°). The higher temperature is necessary for a "good finish." The machine ironers and hand irons are usually heated to 135°–145°.

The lowest temperature at which different fabrics are sterilized is: 140° C. for woolen; 120° for flannels; 110° for muslin. Flannel and colored muslin and linen are usually washed in water not exceeding 110°, but, as the irons and mangles are heated to at least 135°, even these fabrics are sterilized by heat.

Exposure to 150° for 8 seconds sterilizes all fabrics, as the protoplasm of microörganisms coagulates at 120°–150°. Even spores of anthrax and tetanus are killed in 4 minutes in boiling water, or by exposure to a current of steam at 100° for 5 minutes (Pfuhl).

Soap.—Rodet, in determining the antiseptic properties of plain soap, tested the inhibitory action on the growth of bacteria in favorable culture media, and also the direct bacteriolytic action. He found that 1 per cent. solution of soap not only inhibits the growth, but actually kills the typhoid bacilli in a few minutes. The average strength of the soap solutions used in laundries is 1½ per cent. to 2 per cent. The antiseptic action of soap rises with the temperature, and is also increased by the addition of sodium carbonate, which acts by virtue of the sodium liberated. The contact with the disinfecting alkali is multiplied by the constant rotary motion of the wash wheel.

The addition of antiseptics does not materially enhance the bacteriolytic action of soap, according to Reithoffer. Hence the potassium permanganate soap prepared at extra expense for one laundry in New York City is not more efficacious than the plain soap.

The action of disinfectants is enhanced if the clothes have been previously moistened. Chamberland and Fernbach made some tests on B. subtilis, the organism most resistant to heat. They found that a 10 per cent. solution of calcium hypochlorite at a temperature of 15 degrees C. killed all non-spore-bearing organisms in 15 to 30 minutes if the linen had been soaked in cold water, but required 2 hours if the linen was dry. The disinfectants penetrate into the cell protoplasm of the microbes with greater ease if the enveloping cell membrane is moist.

Other Chemicals.—Chief among these is calcium hypochlorite which is used in filtered solutions of from 1.5 per cent. to 3 per cent. Opinions differ as to the antiseptic value of calcium hypochlorite. Kolesnikoff states that a 5 per cent. solution kills dried anthrax spores in 10 minutes. Koch, on the other hand, found them alive after two days.

Some New York firms have abandoned the use of calcium hypochlorite and bleach the clothes with watery solution of chlorine gas generated by electrolysis on the premises. Flannel

is generally bleached by dilute sulphuric acid with 2 per cent sodium bisulphate which combine to form sulphurous anhydride with liberation of oxygen.

Dilute hydrochloric acid or acetic acid are used in blueing the clothes.

Occasionally attempts have been made to introduce chemical antiseptics, notably zonol, but they have been abandoned after brief tests, usually on account of the unpleasant odor to which the customers object, on account of fixing stains, or on account of damage to fabrics, which, however, can be avoided, in the case of bichloride by the addition of HCL.

It is obvious that there is no danger to public health from "mixed washing" of clothing with contaminated articles. However, while the washing process practically sterilizes the clothes, reinfection of clean linen is possible where it is sorted and counted in the same room with soiled linen. Clean linen, when exposed to infection through contact with soiled linen, may disseminate the infection.

Are Diseases Transmitted Through Soiled Linen?

Why have the present methods of disinfection and quarantine failed to stamp out infectious diseases?

Because: (1) Reportable diseases are not always reported. Many parents evade declaration, and mild or atypical cases frequently escape detection, or are accidentally discovered as in one case in my experience in which a child was brought to a dispensary to be vaccinated and was found to have scarlet fever. (In this case the family washing was sent to a "wet wash" laundry.)

(2) Many diseases are contagious before it is possible to establish the diagnosis, *e. g.*, measles is contagious during the incubation period.

(3) Not all infectious diseases are reportable, as influenza and erysipelas, or, if reportable, impossible to isolate properly, as trachoma.

In view of the fact that soiled body linen is known to harbor the disease-breeding organisms discharged from the host, is one not justified in considering the manipulation of soiled linen as one of the possible causes of the failure to eradicate the infectious diseases?

The pathogenic organisms in soiled linen may cause either *direct infection of* the workers manipulating the linen, or *indirect infection through* the workers (carriers). Inhalation of dust and the poor ventilation predisposes to infection of the mucous membranes, and thus prepares the soil for infection.

There are three modes of infection—inhalation, inoculation (through wounds, or through touching the face and eyes), ingestion (wetting the fingers in counting the clothes, or through eating).

Arlidge states that "when washing the clothes of the sick, washerwomen are exposed to contagion, are liable to erysipelas following abrasions, to onychia and festering sores of the fingers. When a mechanical hurt happens to their hands in a softened state, the wound is difficult to heal and often suppurates."

The superintendent of the laundry in one of the city hospitals stated that

before disinfection of the linen in the wards was enforced, infected hands were extremely common among the workers.

The high bacteria count of soiled clothes is shown by Miquel's experiments. He found that the bacteria count of the "first water" is higher than of the impurest sewerage, 25,000,000 bacteria to 1 cc. Of this number 2,000,000 are disease-breeding, as already stated.

Typhoid bacilli have been isolated from the bed linen and body linen of typhoid fever patients as early as the third day of the disease in some cases (Remy), and on the twelfth day in the average case (Vidal and Chantemesse, quoted by Marquet, *loc. cit.* p. 28). Murchison cites a case (Marquet, *loc. cit.* p. 29) in which typhoid fever was contracted from the bedding used by a typhoid fever patient.

The resistance of typhoid bacilli is very great. Epidemics have been caused by pollution of stream with surface water after the bacilli, deposited on the ground through typhoid carriers, have been frozen for months.

The typhoid bacillus is known to retain its virulence for one month in a dry medium; hence the disease may be communicated to those who handle linen soiled with typhoid excreta.

Scarlet Fever is contagious during the period of incubation and the prodromal stage, as well as during the stage of desquamation. The virus retains its virulence for long periods.

Vergeley cites an instance (Joltrain, *Journal d'hygiene*, 1893, p. 546) in which a physician contracted scarlet fever from a coat which he had worn one year previously while attending to a scarlet fever patient. The coat had been sent to his country place, and when he went there a year later he developed scarlet fever a few days after wearing the coat.

The atypical forms without any rash not infrequently escape detection, and many cases of so-called tonsilitis are in reality scarlet fever.

Measles is also contagious during the incubation period. It is known that the virus of measles loses its virulence after a few hours (Grancher, quoted by Marquet, *loc. cit.* p. 32). Infection would be possible, however, if clothing were sent to a laundry within a few hours after being removed from a child with measles.

Diphtheria.—One has only to call attention to the number of cases of persistent nasal discharge without marked constitutional disturbances in children, due to the Klebs-Löffler bacillus, besides the great number of carriers, to see that clothing handled in the laundries may expose the workers.

Whooping Cough.—The same is of course true of whooping cough, as its causative agent is harbored in the nasal discharge and bronchial secretion.

Smallpox.—Dardeau mentions epidemics in paper factories in France traced to linen rags coming from California where the disease raged. Several similar epidemics in England have been studied by Pearson in the period 1875–1881, and an epidemic in Boulogne-sur-Seine in 1900 was traced to a laundry.

I quote the following from the report of the English Lancet Commission, 1877:

"At the St. George's Public Laundry, a washerwoman, instead of emptying the copper used by her predecessor, boiled her linen in the same water, and as her husband died of smallpox a few weeks afterwards, and her child was very ill with the same disease, the widow made inquiries and found that the woman who had washed before her had smallpox in the house. Probably, however, the disease was not caught from the copper where the water boiled, but from the floor, etc."

"A washerwoman continued to take in washing while her boy was ill with smallpox. In addition to exposing the customers to infection, the boy's aunt, who assisted at the washing, took the disease home to her husband, who became ill three weeks after the boy and died in a few days."

Tubercle bacilli are quickly killed by drying and exposure to sunlight, but live long in moisture. Handkerchiefs, an excellent vehicle for tubercle bacilli, are difficult to count accurately, because they stick together and get lost among the bigger pieces, and require much handling and shaking, and sometimes have to be counted several times over.

Nevertheless, the mortality from tuberculosis among laundry workers compares very favorably with other trades. Ira S. Wile in 1904 found that 5.3 per cent. of laundry workers have tuberculosis, as compared with 17.6 per cent. in some other trades. Landozy and Marmisse (Marquet, *loc. cit.* p. 38, 40) give a slightly higher figure, but still lower than in other trades.

Lombardo (Marquet, *loc. cit.* p. 38) has found that those working in an atmosphere of high humidity are "practically immune" to tuberculosis, which may account for the comparatively low figures.

At the Brompton Consumption Hospital 2.5 per cent. of the patients for the period of 1889–1891 were laundresses.

The experiments of Letulle, reported before the Academie de Medecine, July 22, 1913, give valuable data on the infectivity of linen contaminated with tubercle bacilli. Out of 50 guinea pigs breathing air in which handkerchiefs contaminated with dried tuberculous sputum were shaken, 45 died of tuberculosis of a very severe form. Letulle concludes that shaking and manipulation of soiled linen of tuberculous subjects, especially the handkerchief, is unquestionably an important factor in the transmission of the disease. The experiments of Chausse support his view. The period of infectivity does not extend beyond the twentieth day unless the clothing is put away while moist.

Venereal Diseases.—The bacillus of Lustgarten does not easily resist drying so it is unlikely that syphilis is propagated through the medium of soiled linen. On the other hand, the ease with which gonorrhea is transmitted through clothing is shown by the fact that the admission of one gonorrheal child to a hospital ward makes the disease spread like wildfire. At the Babies' Hospital in New York the attempts to control the spread of

gonorrhea were unsuccessful, despite rigid disinfection of the diapers, until their use was abolished and they were replaced by paper napkins.

In view of the widespread prevalence of this disease, the fact that the best laundries refuse to accept linen from disorderly houses offers very poor protection to the laundry workers.

In the light of recent investigation it is thought that transmission of disease germs is nearly always "immediately from one warm, moist mucous surface to another, and rarely by intermediate transmission" (Northrup).

If this be true of the exanthemata, it can hardly apply to the air-borne diseases, *e. g.*, influenza, and to many grave infectious diseases, *e. g.*, the venereal diseases, typhoid fever, etc., which are known to be transmitted through fomites.

The question therefore arises: What measures have been taken, or can be taken towards protecting the workers?

The importance of this subject was already recognized in England in 1877, when a Lancet Commission was appointed, as a result of "cases of undeniable transmission of disease, especially smallpox, through the intermediary of laundry workers," to determine the danger to workers and to the public from soiled linen. The commission condemned the practice of handling soiled linen in the same room where clean linen is kept, "as we do not always know when clothes are infected, and must sometimes unwittingly send them to the laundry when they should be sent to the disinfecting oven."

Nine months later the first model municipal laundry was established. Its chief feature consisted in a receiving section separate from the laundry proper, with a separate staff of workers, and equipped with two tanks with cold, *running* water, charged with carbolated soap in suitable proportions, the one with the weaker solution for ordinary linen, and the other tank for suspected or especially soiled linen. Baskets provided for the customers were divided into two compartments, and on arrival at the receiving house, the contents of each compartment were emptied into their respective tanks. In this manner all handling of the soiled linen was eliminated.

Lord Lytton, in introducing the laundry clause in the Factory and Workshop Bill in 1902 stated that small laundries present a greater menace than the large ones and are centers of diffusion of contagious diseases, especially smallpox and scarlet fever.

In Paris the "bateaux-lavoirs" (special river boats used for the purpose of soaking soiled linen in the Seine in order to dislodge the albuminous discharges before the actual washing) had been in existence since the year 1623. Attention was accidentally drawn to this nuisance in 1885 when they had become so numerous as to impede traffic. The prefect of police of the Seine district then commissioned Miquel to report on the possible contamination of the Seine through the bateaux-lavoirs with the result that their use was henceforth prohibited.

The danger to workers was recognized by the Board of Health of the

District of Gironde, and in 1889 a law was passed enforcing the establishment of tiled rooms for the sorting and counting of soiled linen, the use of impermeable bags for the collection of soiled linen, and other measures for the safeguard of the workers.

The Paris Municipal Council appointed a Commission in 1896 to study the diseases which laundry women may contract from sorting, counting and marking soiled linen. Deschamps, Medecin Inspecteur de Service des Epidemics, who drew up the report, stated that the risk to workers was obvious, and dwelt especially upon the danger of the small laundries.

In 1905 the following rules were passed in France:

(1) All soiled clothes shall be received in closed bags of impermeable material, which must not be opened in the delivery wagons.

(2) The bags, with contents, shall be disinfected before handling by the workers.

(3) Gowns, worn exclusively at work, shall be provided for those handling soiled clothes. Before leaving the building the gowns shall be hung up in rooms provided for the purpose. These rooms shall be equipped with washstands and the workers shall be compelled to wash hands and face before leaving the room.

(4) Soiled linen shall not be received, sorted, marked or counted in rooms where clean linen is kept.

(5) The first rinsing water shall be led off in *covered* gutters.

(6) Eating or drinking in rooms where soiled linen is kept shall be prohibited, and workers shall be instructed in personal hygiene and informed of the dangerous character of work.

(7) All workers must present certificates of vaccination.

In the public laundries of *New York State* practically no measures are taken for the protection of the workers.

In some laundries the soiled clothes are sorted, marked and counted in separate rooms, but in the majority they are manipulated in the same room, and often in close proximity to the clean clothes. In one otherwise up-to-date laundry with a large trade from the transportation companies, the soiled table and bed linen from the transportation companies is received, sorted and counted in an anteroom, while the family linen—of course the most infectious—is handled in the same room with the clean linen.

An attempt is made in the better laundries to minimize the manipulation of soiled linen by the use of the "counting board" and the mechanical marker, but even then a certain amount of shaking and handling is inevitable.

The following bill was introduced into the legislature but was defeated through the efforts of laundry owners on the ground of prohibitive expense.

ASSEMBLY (Feb. 3, 1909). BILLS (No. 455, Int. 440).

An Act for the Supervision of Laundries for the Prevention of Contagious Diseases.

Introduced by Mr. Baumann, Feb. 3, 1909, read once and referred to the Committee on Public Health.

SECTION I. That all places doing business as laundries or any place

accepting public washing shall not receive or accept any washing, unless said washing is confined to a cloth bag properly tied, the contents of which shall not be removed in said laundry, or any place in connection therewith, for any purpose until the contents of said bag has been subjected to a heating fumigation of not less than two hundred and twelve degrees of heat for not less than twenty minutes.

SECT. II. The violation of the provisions of this act shall be deemed a misdemeanor, punishable by a fine not exceeding fifty dollars for the first offense, and punishable by a fine of not less than twenty-five, nor more than fifty dollars, or imprisonment not exceeding thirty days, or both, for the second offense.

SECT. III. It shall be the duty of the department of health of all counties to enforce this Act.

SECT. IV. This Act shall take effect September 1st, 1909.

We have seen what has been and is being done toward laundry regulation in France and England, and that the seriousness of the subject is realized in those countries. The only evidence of similar activity in this state met the concerted action of laundry owners who killed the one and only attempt to remove the danger of infection through laundries. The fact that the remedial measure suggested in Baumann's Bill was not practicable is no reason for letting the evil continue unabated.

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Since the conclusion of this study a very pertinent illustration of the danger to laundry workers was furnished in April when New York City was threatened with an epidemic of smallpox. A woman who came from Jacksonville, Florida, where smallpox had broken out, developed the disease after her arrival in New York. The colored woman who was employed as laundress in the family visited by the smallpox patient was later taken ill with the same disease.

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MUNICIPAL HEALTH OFFICERS AND VENEREAL DISEASE.

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Read before the Public Health Officials Section of the American Public Health Association, Jacksonville, Fla., December 1, 1914.

THE method for the control of venereal disease now in vogue in the United States army is as follows:

1. The A & N prophylactic packet was designed, as to formula and package, by the officials. For a time it was distributed by the government to hospitals. Now its sale in the post exchange is recommended by the surgeon-general.

2. The rules prescribe that any soldier who has been exposed, upon returning to camp, shall at once report at the hospital where he is given a local treatment with silver salts or potassium permanganate and calomel preparations.

3. Any soldier developing a venereal disease acquired after enlisting is punished unless the record shows that he was treated at the hospital subsequent to exposure. Punishment is for disobedience of rules and not for having a venereal disease.

4. Venereal disease is reportable.

5. Dispensaries and hospitals for venereal disease are provided.

6. Laboratory facilities are provided for diagnosis of venereal disease.

7. Men excused from duty on account of venereal disease lose their pay during the period of disability and also have to make up time lost.

8. The men are taught the facts concerning venereal disease by lectures and pamphlets.

9. Prostitutes are kept off the reservation and as far as possible from its bounds.

The United States army had its maximum venereal disease admission rate in 1905. That rate was 200. Since that time the above methods of prevention have come into use. One effect of centering attention on a disease, particularly where new methods of diagnosis and treatment are proposed, is securing so much more complete reports of cases as to cause an apparent increase of cases. In spite of this influence the rate in the United States has fallen to a rate in 1913 of 85.83. I am informed by army officers that a further and continued fall is expected.

Certain European army venereal disease admission rates are as follows:

British Army	66	1909	
German Army	19	(Kean)	1912
French Army	27.8	"	1907
Austro-Hungarian Army	54.2	"	1907
Spanish Army	92.66	"	1908
Russian Army	54.3	"	1908

Venereal disease in various navies (1905 to 1909—Kean):

German	66
French	75
Italian	83
Japanese	167
British	120
American	160 (1909)

Since 1880 New Orleans has been free from yellow fever with the exception of one or two invasions.

The quarantine methods prior to 1880 were stricter than public opinion would endorse. In 1880 the method was changed from the Jones to the Holt quarantine. Public opinion was ready for the Holt quarantine and in consequence it was a success. As we know the epidemiology of yellow fever neither method was right. The Holt was no nearer than the Jones but it succeeded better because it permitted greater personal liberty.

When we come to discuss municipal control of venereal disease it is proper to discuss in detail the procedures employed by the military arm to discover what is applicable to municipal conditions and how it can be applied.

As to education Doctor Fronczak of Buffalo says: "The treatment of venereal diseases has too long been left in the hands of charlatans and leeches who suck out the gold while they frighten their victims into a silence. Their victims are numbered by the thousands. Why this disease, which always has been and always will exist, should be left in the hands of quacks and unscrupulous persons, rather than treated by reputable physicians or assisted by municipal authorities, is explainable only through the delicacy felt by the unfortunate victims. At one time patients suffering from cancer or tuberculosis considered the same privacy as essential, and in some places this condition is still met, but it is gradually fading. We can readily understand why a man or woman, who, either innocently or otherwise, has acquired a venereal disease, should shrink from permitting that fact to become public property. For the same reason they do not always consult their family physician whose counsel and help would be inestimable. In order to preserve their secret they usually consult advertising quacks and learn, when too late, that they have done the very thing they sought to avoid. The quack who can thrive only by fraud, deceit, and everything that is unscrupulous, throws out such alluring baits, both as to his guarantees to cure and his work without pay, that the victim allows him to proceed. It is soon found that these guarantees and promises must be met by the patient with the required amount of cash and the patient finds that this is the beginning of a continuous blackmail. Is it any wonder that we have hereditary syphilis, that our asylums are becoming more and more crowded, and that our suicides increase?

In many parts of the country, health departments or private philanthropies, or both, have started reactionary measures, such as making venereal diseases reportable like other communicable diseases, making free examinations for gonorrhœa and syphilis, providing hospital care for those in need, and what will perhaps be the most efficient of all, the inauguration of a system by which the influence of the venereal quack is minimized. This is done by a systematic meeting of the quack's methods. Public waterclosets which are plastered with venereal advertisements, are decorated with warning cards. Public advertisements

in the press are offset by other advertisements issued for the purpose of calling attention to the impossibilities of fraudulent advertisements, the impossibility of curing as guaranteed, and the impossiblity of any person existing and continuing to do business under heavy expense without proper remuneration, and, therefore, the impossibility of treatment without pay, and finally advising such unfortunates what to do. All these methods are valuable. Each has its advocate, and each must leave an impression.

From many years of observation I maintain that nothing will be accomplished until authority is vested where it belongs, namely, in public health departments. My first plan would be to make it impossible for any person to practice a medical fraud. It would seem that there is already sufficient law covering this point, but it is difficult to enforce. The influence of the quacks, through the millions they spend in advertising is so great as to render it extremely difficult to put them out of business. In Buffalo we have succeeded in abolishing a few of the worst ones by merely obtaining a fraud order from the Post Office Department by which it was impossible for the quack to receive mail, and which also made it impossible for the papers containing his advertisement to be mailed. No community will tolerate another person who advertises deceit and fraud, and why the medical quack should be given preference is difficult for the ordinary person to comprehend. Not only this, but it is an insult to the common decency of every community."

Health officers will adapt the methods of education employed to suit their communities and to accord with their own judgment.

The A & N protective packet will be taken care of by the commercial interests. They will operate by vending machines as well as through drug stores. Health departments need not concern themselves about this procedure.

The cleaning up after exposure and the punishment for failure to comply with rules bearing on this subject have no place in the program of a municipality. Of these procedures in use by the military arms the following educational measures—laboratories, dispensaries, and hospitals, reporting and the regulation of commercialized vice—are in some measure within the province of state and municipal health departments.

The second natural next step is equipping the laboratories to do diagnosis work in venereal diseases. The most important work and that with which the laboratories should begin is the examination for spirochetes and for gonococci, in the fresh infections. This should presently extend to embrace Wasserman's and complement fixations. It happens that the examinations which are easiest done are those which disclose the diseases in their most actively infectious stages. If a laboratory is pushed for time let it abandon the chemical examination of milk to make place for venereal disease work. Many health department laboratories are now doing work on venereal diseases. New York leads in such efforts.

The third step in natural sequence is the establishment of dispensary facilities.

In 1910 Chicago began this work with a municipal venereal disease dispensary run as a part of the work of the Iroquois Memorial Hospital. This work is now in abeyance but it will be renewed. New York began with a dispensary for counsel and advice. It operates largely to keep the unfortunates out of the hands of the quacks. In time it will assume all of the legitimate functions of a dispensary.

Venereal disease dispensaries should run in the evenings as well as during the day; on Sundays as well as on week days.

As venereal disease cases during their actively infectious stages are not confined to their beds, venereal disease dispensaries will be in greater demand than venereal disease hospitals. They will perform a much greater service and dollar for dollar they will care for more cases than will hospitals. Nevertheless in the larger cities venereal disease hospitals will be the natural next step. The Chicago Vice Commission recommends that there be one bed set aside for venereal disease for each 2,000 inhabitants.

In order to secure a proper interest in venereal diseases and to make it possible to operate measures for control it will be necessary to have venereal disease reported. I have been able to find the following laws and ordinances dealing with this subject:

Vermont—"SEC. 1. Commencing on the date of the passage of this act the superintendent or other officer in charge of public institutions such as hospitals, dispensaries, clinics, homes, asylums, charitable and correctional institutions, shall report promptly to the State Board of Health the name, sex, age, nationality, race, marital state, and address of every charitable patient under observation suffering from venereal diseases in any form, stating the name, character, stage, and duration of the infection, and, if obtainable, the date and source of contracting the same.

"SEC. 2. Physicians shall furnish similar information concerning private patients under their care, except that name and address of the patient shall not be reported.

"SEC. 3. All information and reports in connection with persons suffering from such diseases shall be regarded as absolutely confidential, and shall not be accessible by the public nor shall such records be deemed public records.

"SEC. 4. The State Board of Health shall provide, at the expense of the state, facilities for the free bacteriological examination of discharges for the diagnosis of gonorrhœal infections, and also shall provide, at cost, vaccines or antitoxins for the treatment of such infections. And said board shall make, at the expense of the state, the Wassermann test or examine smears for the diagnosis of syphilis; and shall furnish the treatment known as 'Salvarsan' or other accredited specific treatment at cost. But such diagnosis and treatment shall not be furnished until the data required for the registration of the case has been furnished by the physician or institution treating the patient.

"SEC. 5. The State Board of Health shall include in bulletins

or circulars distributed by it information concerning the diseases covered by this act."

Indiana—"Rule 10 of the rules of the Indiana State Board of Health duly passed as appear in the minutes of the board shall be amended to read as follows, to wit:

"RULE 10—Infectious Diseases. The infectious and contagious diseases which shall be immediately reported to the health officer having jurisdiction and which shall be quarantined are hereby declared to be: yellow fever, smallpox, cholera, diphtheria, membraneous croup, scarlet fever, measles, epidemic poliomyelitis, cerebrospinal fever, typhus fever, bubonic plague, leprosy, pulmonary consumption, typhoid fever, chickenpox, whooping cough, trachoma, syphilis and gonorrhœa; provided pulmonary consumption, typhoid fever, syphilis and gonorrhœa shall not be quarantined, as they are to be reported for record and statistical purposes only."

Michigan—"Venereal diseases. 1. Must be reported to local board of health, but report may be made by number or initials, rather than by the patient's name."

Florida—"Rule 67 of the regulations of the State Board of Health adopted February 27 and 28, 1912 (Public Health Reports, Dec. 6, 1912, page 2041) was amended so as to include 'venereal diseases' in the list of diseases the nature and danger of which are to be explained in literature to be distributed by local health officers and representatives of the State Board of Health."

Kansas—Morbidity reports, Regulation Board of Health, Dec. 13, 1913. "That in the reports of cases of the venereal diseases the name and address of the patient need not be given, and that all such reports of venereal disease shall be made direct to the State board of health on special blank."

Porto Rico—"SEC. 28. That in conformity with the provisions of this act physicians shall report to the nearest health officer any of the following diseases which they may be attending, or may have seen: Exanthematous typhus, typhoid fever, Malta fever, Asiatic cholera, smallpox, varioloid, scarlet fever, diphtheria, bubonic plague, yellow fever, dengue, beriberi, epidemic dysentery, epidemic cerebrospinal meningitis, whooping cough, epidemic parotiditis, filiariasis, tetanus infantum, malaria, tuberculosis, glanders, leprosy, uncinariasis, colibacilosis, infectious pneumonia, malignant putule, and cutaneous syphilis."

Manila—"Public Dance Halls, Communicable Diseases in. Examination of Females:

"SEC. 1. It shall be unlawful for any person to dance in any public dance hall in the City of Manila who has tuberculosis or any dangerous communicable disease.

SEC. 2. It shall be unlawful for any person of the female sex to dance in a public dance hall, whether for a fee or otherwise, without having a valid certificate from the bureau of health showing that such person is free from tuberculosis or other dangerous communicable disease.

"SEC. 3. Such certificate of the bureau of health shall be issued from Station J, Intramuros, only after such examination as may be necessary to determine the state of health of the

person examined, and shall be valid for 30 days only from the date of issue: Provided, however, that all examinations of females required by this section shall be made by a female physician.

"SEC. 4. It shall be unlawful for the owner, proprietor, manager, or person in charge of any public dance hall to allow or permit any female to dance in such public dance hall without having a certificate as required in section 2 of this ordinance.

"SEC. 5. Any person violating any of the provisions of this ordinance shall, upon conviction, be punished by a fine not exceeding 200 pesos or by imprisonment not exceeding six months, or by both such fine and imprisonment, in the discretion of the court."

Montclair, N. J.—Morbidity reports, Venereal diseases. Wasserman Test (Reg. Bd. of H., Jan. 28, 1913):

"*Resolved*, First, That on and after March 1, 1913, the superintendent or other officers in charge of all public institutions, such as hospitals, dispensaries, clinics, homes, asylums, charitable and correctional institutions, including all institutions which are supported in whole or in part by voluntary contributions, be required to report promptly to the board of health the home, sex, age, nationality, race, marital state, and address of every patient under observation suffering from syphilis in every stage, chancroid, or gonorrhœal infection of every kind (including gonorrhœal arthritis), stating the name, character, state, and duration of the infection, and the date and the source of contraction of the inspection, if obtainable.

"Second, That physicians are requested to report promptly all cases of venereal diseases coming under their observation in the future, omitting the name and address, if desired, but always giving the initials for identification in case of duplicate reports, and stating the sex and age of the patient, the name, character, stage, and duration of the infection, and the date and source of the inspection, if obtainable.

"Third, That cases reported by private physicians will be filed by case numbers, which will be given to the physicians for future identification when the cases are acknowledged.

"Fourth, That a supply of report cards be used for this purpose will be forwarded on request. All information will be regarded as absolutely confidential and will not be accessible to the public, nor will the records be deemed public records.

"Fifth, Diagnosis of venereal diseases, That the board of health will hereafter make, without charge, the Wasserman test for the diagnosis of syphilis, and will also provide facilities for the free bacteriological examination of specimens which have been taken for the diagnosis of gonorrhœal infections. The board will also furnish treatment for indigent cases.

"Sixth, The outfits with full directions for obtaining specimens will hereafter be furnished to physicians free of charge at the office of the board of health."

The majority of the ordinances and laws dealing with venereal disease were passed during 1913 and 1914. In 1909 Chicago passed an ordinance requiring that dispensaries should report venereal diseases. This law reads as follows:

DISPENSARIES.

"ART. VIII, Sec. 1210, second paragraph. It shall be the further duty of such licensee to report weekly to the department of health all cases of consumption, typhoid fever, syphilis, gonorrhœa, with the names and addresses of patients suffering from such diseases or any of them treated or reported to such dispensary."

On Nov. 7, 1914, Health Commissioner Young issued the following statement through the weekly bulletin:

"In execution of duty imposed by Section 1191, and in pursuance of the authority contained in Section 1192, of the Municipal Code, I, as Commissioner of Health, hereby declare that foot and mouth disease, occurring in human beings, is a contagious disease within the meaning of the code, and must therefore be reported to the Commissioner of Health within twenty-four hours after first discovering the existence of such disease."

Section 1191 and 1192 read as follows:

"1191. Isolation, Posting Notice, Penalty. It shall be the duty of the commissioner of health to impose such restrictions upon, and to exercise such supervision over, all persons afflicted or sick with smallpox, scarlet fever, or any contagious or epidemic disease, as shall be necessary to protect from such disease all persons not of necessity connected with any person so afflicted or sick. To aid in securing the isolation of a person afflicted or sick with a contagious or epidemic disease, the commissioner of health may cause a notice, printed or written in large letters, to be placed upon or near any house in which any such person may be, upon which notice shall be written or printed information setting forth the contagious or epidemic nature of the disease. If after any such notice shall be so posted any person shall deface, alter, mutilate or destroy, or tear down such notice, without permission of the commissioner of health, such person shall be fined not less than twenty-five dollars nor more than fifty dollars for each offense, and every occupant of any house or building upon which any such notice shall be so placed or posted as aforesaid shall be held responsible for the removal of the same.

"1192. Physicians to Report. Every physician who shall prescribe for or attend any person having a contagious or epidemic disease, such as cholera, yellow fever, scarlet fever, diphtheria, typhus, typhoid fever, smallpox, varioloid, puerperal fever, membraneous croup, measles, whooping cough, or any of the grades of such diseases, or any other disease designated as contagious or epidemic by the commissioner of health, shall, within twenty-four hours after first discovering the existence of such disease, make a report thereof in writing to the commissioner of health, which report shall give the name, if known, and the place of dwelling of the person having such disease, together with the character and state of his disease. For the purpose of covering the expense of making each such report the physician making the same shall receive the sum of ten cents; provided all

claims for fees for such reports shall be presented before the fifth day of the month succeeding that in which such reports were made."

Acting under the authority of Sections 1191 and 1192, in 1909, the health commissioner of Chicago placarded two houses of prostitution in which there was proof that two groups of school boys had been infected with venereal disease. The placards read: "Syphilis here" and "Gonorrhœa here,", respectively. The act of the commissioner was not contested in the courts but out of it there grew the agitation that resulted in the Chicago Vice Commission. The report of this Vice Commission in its chapter on Health Department and Venereal Disease says: "Under the police powers now granted by the state except where specifically limited by statute, the Department of Health could quarantine persons when notified of venereal diseases in them by physicians."

In 1912 the New York City Board of Health passed regulations which, under their basic law, are equivalent to ordinances, requiring that venereal diseases be reported, establishing dispensaries and inaugurating laboratory service for venereal diseases.

These citations prove that the public mind is ready for the control of venereal disease by the municipality and that the time has come for the discussion of such details as the use to be made of the reports, control of patients having venereal disease and methods for the support of venereal disease hospitals.

In olden times officers encouraged the presence of prostitutes with armies. In recent times the policy has been to keep the prostitutes away from armed forces as much as possible. In olden times there was some disposition of municipalities to permit houses of prostitution and red light districts and even to attempt to segregate and regulate them.

This section has twice discussed the subject of regulation of vice. It has been easy to see that the opinion of the section was opposed to it. The section on Preventive Medicine of the American Medical Association has gone on record as opposing segregation and regulation of vice.

One of the recommendations of the Chicago Vice Commission was that a morals commission be established. The city council, in obedience to that recommendation is now considering the following ordinance:

"Section 1. That there shall be and hereby is created in and for the city of Chicago, a commission to be known as the 'Morals Commission of the City of Chicago,' the members of which shall be appointed by the Mayor with the approval of the City Council, and which commission shall consist of five (5) persons who shall be qualified electors of said city and each of whom shall have resided therein at least one year preceding his appointment. The Commissioner of Health of the city of Chicago shall be ex-officio one of the members of said commission. A second member of said commission shall be a physician in good standing.

"Section 2. The members of said commission shall take the oath of office and file the bond provided by

law for officers of said city: Provided that no additional bond shall be required of the member of said commission who shall be the Commissioner of Health of said city. Such bond shall be in the penal sum of One Thousand Dollars ($1,000) and shall be conditioned according to law.

"SECTION 3. The term of office of the Commissioner of Health as ex-officio member of said commission, shall be during the time that he shall be Commissioner of Health of the city of Chicago. The term of office of the other members of said commission shall be two (2) years and until their successors shall be appointed and qualified. The Commissioner of Health of the city of Chicago shall not receive any additional compensation as a member of said commission. The other members of said commission shall serve without compensation. It shall be the duty of the Commissioner of Public Works of the city of Chicago to furnish to said commission suitable quarters without charge.

"SECTION 4. The Commission shall have power to appoint according to law at a salary to be fixed by the city council and to appoint according to law such clerical and other assistants as the city council from time to time shall determine.

"SECTION 5. It shall be the duty of said Commission to study all phases of sexual immorality in its various forms, their causes and effects; and the conditions or practices which tend to promote or restrict them, including all practices which are physically or morally debasing in their effect, or which concern the physical or moral welfare of the inhabitants of the city, with a view to securing both the prevention and correction of such practices and conditions. It shall make a study of the measures necessary to secure the physical and moral rehabilitation of prostitutes, the prevention of prostitution and of venereal disease, of the legal action necessary for the effective suppression of bawdy and disorderly houses, houses of ill-fame or assignation within the city of Chicago and within three miles of the boundaries of said city, and the legal action necessary for the prosecution of the owners, keepers, inmates and patrons of said houses.

"It shall advise the prosecuting attorney and the general superintendent of police of the results of its investigations and of the occurrence of any violations of any state laws or city ordinances relating to the control of vice or immorality which it discovers. It shall, from time to time, make report of its findings to the mayor of the city of Chicago and the City Council, and recommend the passage of such statutes, ordinances, and methods of procedure as it deems necessary to secure the objects for which it is established, and shall publish such reports as it may deem necessary.

"SECTION 6. Said commission shall have power and authority to make rules and regulations for the conduct of the business of said commission and otherwise not inconsistent with the provisions of this ordinance.

"SECTION 7. Nothing in this ordinance shall be so construed as to relieve the general superintendent of police, or or the second deputy super-

intendent of police or any officer of that department, or the prosecuting attorney, of any duties so imposed upon them or any of them by the ordinances of the city of Chicago and it shall be the duty of all heads of the various departments of the city government and the employes of same to coöperate fully with the Morals Commission of the city of Chicago and to supply it with all information and statistics in their possession.

"SECTION 8. The ordinance shall be in full force and effect from and after its passage and publication."

This ordinance recognizes as a principle that the problems of prostitution are largely medical and builds the control of morals around health rather than the police department.

The figures from many sources such as the St. Charles School for Girls and the Morals Court of Chicago (a court proposed by the Vice Commission) show that about 85 per cent. of professional prostitutes are shown to be definitely mentally sub-normal on the Binet-Simon scale.

The principal cause of prostitution is medical. The principal methods of cure are medical. Prostitution further relates itself to the health department through its relation to the spread of venereal diseases.

There is wisdom in building the Morals Commission around the Health Department.

Discussion.

DR. W. F. SNOW (*New York City*): As doubtless most of you know, I have become individually so much interested in the possibilities of carrying out such a program administratively as Doctor Evans has laid down, that I am now giving my whole time to a clearing house for information of this character, in the position of General Secretary of the American Social Hygiene Association. I do not think anything that any of us could say would more clearly present the gist of the proposition than this brief paper of Doctor Evans. There are now some nine states that have made venereal diseases reportable. There are perhaps nine or ten cities that have made these diseases reportable independently of the state regulation and are following it up with active administrative measures such as have been mentioned here. Doctor Evans has not mentioned, as he stated at the outset, any of the indirect influences that are gradually changing public sentiment and making it possible for the health officer actively to take this up as a preventive medicine problem. After a study now of some six months of the situation over the country, I am more convinced than ever that we have a clear-cut administrative program which has of course many difficulties before it, but which can be carried out. I would like, if it is in order, to present a resolution which I hope will be adopted at the end of the discussion:

"WHEREAS, venereal diseases are a serious and prevalent cause of ill health and suffering among the people of all parts of the country, and

"WHEREAS, scientific knowledge shows these diseases to be preventable, therefore be it

"*Resolved*, That a Committee of this Section be appointed to study and report upon the standardization of administrative measures for reducing the prevalence of venereal diseases and promoting their ultimate eradication."

In explanation I would say this, that study of these plans which are now being launched shows there is very great opportunity to bring together these administrative measures upon a common ground, and I believe there is no organization like this of the American Public Health Association to sanely and effectively study the measures that are being attempted and perhaps to suggest new measures that are more practical.

DR. HAVEN EMERSON (*New York City*): Doc-

tor Evans has said that the city of New York is likely to become involved in the administrative control of dispensaries for the treatment of these diseases. I think it may be questioned whether that is to be adopted by the city until it has been proved that the existing dispensaries are not capable of handling the situation. There are many advantages in spreading the knowledge of the public health attitude among the physicians at dispensaries who have the responsibility for the care of the indigent sick, and if the city assumes this as an administrative function, we will at the same time antagonize a great many physicians and lose the benefit of the educational propaganda we must spread largely through the physicians.

There is at present in New York City an association of venereal disease dispensaries organized in a similar way to tuberculosis dispensaries. They are doing their best to come up to the standards of treatment that we think should be adopted. There are many that lack the dark field microscope, many that lack the means for making the complement-fixation or the Wassermann test, and still more that are unable to carry out up-to-date or efficient treatment. Yet the cost of having the city administer these dispensaries would be enormous and would meet with tremendous opposition. The organized physicians are definitely against having any such work taken on by the city. It is accepted that the function of the city department as to notification and diagnosis can have the widest range, but when it comes to assuming treatment of these diseases, there is unanimous disapproval, and I think it would be fair to say that until it has been proved that the dispensaries, either associated with hospitals or others, are unable to accomplish proper treatment of the patients that apply to them, it should not be assumed as one of the functions of the city department of health.

There is one other side of this, that physicians throughout the country must take upon their shoulders. The quack is an expression of a sore spot on the medical practice. The medical practice act gives the licensing board of the state very large control that they declined to assume or exert. It is almost impossible to eliminate the quacks until the professional bodies, county societies and organizations and state societies, take up the job of cleaning their own house. We have been doing our best to detect and convict the people practising illegitimately and our plan has been this, that detectives who have been tested on the day of their visit to these quacks for gonococcus, etc., have had complete physical examination, have then gone to these offices, have been subjected to a so-called X-ray examination, they have been told they had syphilis, that gonorrhea was in their blood, that it could be seen by the X-ray and treatment was recommended for them. They returned and were tested by the Wassermann test and then cases were brought before the magistrate with the result that in no case have we found that the same physician examined any two of the detectives since. There is a large body of people examining people in New York who have no license to practise, and the county society is the one whose burden it is to clean the city of those people. The department of health of the city does not control the medical practice of physicians as it does that of midwives.

Then there is one further question I should like to state. After you have got a case reported, what are you going to do about it? We are getting a great many reports from institutions and a few from physicians. We shall expect to get more, but after you have got a case reported, what are you going to do? Are you going to placard the house? Are you going to quarantine the individual? What are you going to do with your patient when you have got him reported? As far as I can see, this reporting of venereal diseases amounts simply to stating that we know how many there are; don't know where they are, can't keep them located, can't deny them the privilege of free movement throughout the community; unless we have some control to be maintained, I fail to see yet what the direct, practical result in diminishing disease is going to be except through our opportunity of education. I heartily agree with the program that Doctor Evans has proposed. I doubt whether we are doing all we can with existing powers at our disposal, and I should advise not insisting upon the department of health dispensaries, until the existing dispensaries are able to do their work.

Doctor Fronczak (*Buffalo*): Doctor Evans has given me the honor of quoting extensively from our recent bulletin on venereal diseases. Buffalo is complying with the pro-

gram Doctor Evans has just announced. For the past year or so we have made Wassermann examinations, about 160 every week, of which we find 30 per cent. to 40 per cent. double plus. Those unable to afford hospital treatment are sent to a hospital for two days and the salvarsan administered at the expense of the city. We also make free examination of gonococcus smears. During the past ten months 3,500 of these were sent to us, of which 90 per cent. proved to be positive. Two weeks ago the health department of the city of Buffalo opened a gynecological hospital where we treat venereal diseases, gonorrhea and syphilis and also any disease of the genito-urinary glands, both indoor and outdoor departments.

There is a rule of the department whereby every physician, hospital and dispensary must report venereal disease. We have some trouble with the physicians in private practice reporting, and on the whole I do not believe that we get more than 20 per cent. of these cases reported, but we get a fairly complete report from the various hospitals and dispensaries.

We are distributing now, among high school boys especially, circulars describing the dangers of venereal diseases and we are distributing circulars among the public warning against quacks in the profession. I believe the chief danger is that we have in our profession quite a number of men who are quacks, who are doing everything in their power, as Doctor Emerson just said, to scare men by saying they have syphilis or gonorrhea when they haven't it, and many of the physicians in the profession are members of our great Association. There are certain members of our county society—and they may rave at the meetings against this very thing—who are doing it right along. It will be very necessary for us to clean house among ourselves before we can proceed to clean house among physicians who are not members of the various societies and associations. On the whole I believe that the time is coming when the people at large will take an interest in this subject. You remember the general objection when it was first proposed to report tuberculosis. I believe the time is coming, and coming within five years, when we will have as general reports for venereal diseases as we have for tuberculosis.

Mr. Lawrence Veiller: I think I can suggest a method by which we can go a little faster than the five year time that Doctor Fronczak has suggested and also get an answer to the question, "What can we do with reported cases?" I want to suggest to the health officers that they seize this opportunity by coöperation with the head of their correctional and charitable institutions and inaugurate a system of examination of every man and woman in every charitable and correctional institution run by the city or state and then treatment for their cure. That will take a very large number of people who are suffering from venereal disease. Our Commissioner of Correction in New York has recently caused an examination to be made of the inmates of one institution and found, with regard to the women that over 70 per cent. are infected with venereal disease, and with regard to the men, over 40 per cent. It seems to me that it is perfectly feasible for every health officer throughout the United States, either state or local, to work for legislation which will compel this kind of examination of the wards of the state, or, without seeking legislation, through mere coöperation with the heads of those institutions, to bring about not only these examinations but their subsequent treatment.

Dr. J. H. Landis (*Cincinnati*): I do not believe there can be any special debate on the measures advocated in Doctor Evans' paper. The educational measures, the reportive cases and the treatment of clinics and hospitals. That same process has been followed in the attempt to curtail the number of cases of tuberculosis and typhoid fever. The educational propaganda in Cincinnati as to the boiling of water and the use of filters in private houses was carried on for a number of years. The cases were treated in the hospitals, and still we had a mortality rate of about 80 per 100,000 of population, until we purified the source of the trouble, when our death-rate fell to 25.7 per 100,000. I cannot see how these measures advocated are going to reach the source of the venereal trouble. It is a well-known fact that the houses of prostitution are the distributing centers for gonorrhea and syphilis. Now just the moment that any one advocates the examination of prostitutes, he gets into trouble. He gets into trouble, as a rule, in bodies of this character, and he certainly gets into trouble in his home town. I can see no reason in the world why gonorrhea and syphilis should not be placed on an absolute

level with smallpox and the plague. The fact that you go out and examine prostitutes and isolate those in a hospital that you find diseased is exactly on a par with your method of treating cases of smallpox or the plague. In Cincinnati, as I suppose happens in a large number of cities, there are a number of private physicians who are in the habit of writing certificates of health for prostitutes. We have followed up the work of these physicians for several years, and in Cincinnati we have found prostitutes carrying on their occupation with certificates of health in their possession that had been written within forty-eight hours of the time of our inspection, signed by a physician supposed to be reputable, and in which he stated that the prostitute was free from venereal disease, and at that very time he was treating the prostitute for venereal disease. We have made three surveys in Cincinnati within about a year and a half. On the first survey, as I recall it, out of about 263 examined we sent 43 to the venereal ward of the Cincinnati Hospital. Another inspection was made in the course of six months and a third in the course of another six months. Now the reports that we received from the specialists in venereal diseases and from the hospitals and clinics following those inspections there, showed that there was a decided falling off in the number of such cases of venereal diseases presenting themselves for treatment, and the physicians in one of the hospitals complained that the number of cases had been cut down to such an extent that it was almost impossible to carry on a good clinic in that hospital. That immediately brings up the question of segregation. Any man who advocates segregation immediately gets into trouble, and yet if you treated smallpox as you are treating the prostitutes or as people advocate treating the prostitute, you would scatter smallpox over an entire community. If you handled the criminal classes as the majority of people want these prostitutes, you would scatter your criminals over an entire community. I believe that every city should go at this question along the lines advocated by Doctor Evans, but I do not believe that any city that stops there is going far enough. I believe that these cases should be hunted out. The police know where the prostitutes are located. I believe that the department of health should go down to those places, examine those inmates and isolate in hospitals all found with a venereal disease.

Doctor Burkhardt (*Michigan*): I think possibly the most potential factor in this house-cleaning process has been over'ooked; and that is the public press. Coming from Michigan, where such cases are reported, and which has been the dumping ground for all classes from all states for all time to come, we had not been able to accomplish anything until we enlisted the public press. The K & K Fund, with over $3,000,000, defied every state and city official until the public press took it up. The little state started the ball rolling; the *Times* and the other publications set it going, then the *Detroit News* took it up and from the *News* it went to the *Free Press* and the *Journal;* they refused the advertisements of those gentlemen, started a very vigorous campaign and got the law started in the proper direction, and as a consequence the K & K people served a term in jail, one of them and the other is a refugee. They are out of business and nearly all the quack institutes of Michigan are now on the run. We never would have accomplished it had it not been for the influence of the press. Venereal diseases in Michigan are not reported. I can safely say that only three physicians in the entire state have reported to me a single case of disease, and when they do they are reported by number and I am no wiser. Set the press going and you will eliminate your quacks, but we cannot eliminate the most pernicious influence, the counter-prescribing druggist.

Dr. P. S. Schenck (*Norfolk, Va.*): I want to say just a word too along the practical side of this question. I admit all that Doctor Landis has said about a man attempting to do much along this line, that he will get into trouble, and I am one of those men who has been in trouble on account of this question. Nevertheless I am pushing it just the same. In 1910 the surgeon-general of the United States Navy appointed a commission to examine into the venereal disease question at the seaports. This commission reported that the sailors who went out of Norfolk were more heavily infected with venereal diseases than from any other seaport that the United States ships visited. So prevalent were those diseases among the United States naval vessels, that this committee recommended that

no shore leave be granted to the enlisted men in the city of Norfolk, and that meant a deprivation to the merchants of $6,000,000 or $8,000,000 a year. The Chamber of Commerce and our Board of Trade took the matter up and appealed to the health department to relieve the situation if possible. I decided that I would attempt to do something and appointed four physicians, and since that time we have had a regular, systematic investigation in the segregated districts. With the morals of this I have nothing to do, but, as health officer, the prevention of these diseases has been my sole aim. Right across the river from Norfolk we have a trading station known as St. Helena. Their records are accurate. Any infected sailor has to report at sick bay any infection they may have and have to go through the same routine as to laying themselves open to infection as they do in the army, but they have to report at the sick bay in the United States Navy; if they don't do it, they are fined 60 days pay and put in the brig on bread and water; for 60 days they kept that record and the statistics of St. Helena Station showed they had on an average of 200 venereal infections at all times distributed among these three to five thousand people. We have been working jointly. They keep us posted. I have a bulletin put up in the sick bay of the houses we find infected and the names of the women. When one of their men is infected and applies at the sick bay, they send him over with an orderly. I send him with a physician to the house, the sailor identifies the woman, we examine her and if she is infected we take her out and treat her. From an average of 200 at all times for the past two years they have had less than 20 infections among those men patronizing the same sources, and I say it is fair to assume that if the house of prostitution is the fountain head for the distribution of venereal diseases, while, as Doctor Evans said, you cannot corral the man about town, it is fair to assume that if you can get statistics from the navy as I have described, the same thing would apply to the man about town patronizing the same sources of infection.

DR. CHAS. J. HASTING (*Toronto*): It seems that Doctor Emerson was wise in suggesting our not going too far in the solution of this problem. We have been living in a fool's paradise and I think it would be unfortunate if we fall victims to allowing the pendulum to swing from one extreme to the other. This is largely a matter of education. We have to go slowly. The question was raised in regard to hospitals, venereal hospitals. The Royal Commission that was appointed in Great Britain to make investigations along this line—their ruling and the consensus of opinion of that Commission was that it was not wise to have venereal hospitals or hospitals for venereal diseases, but to insist that all public hospitals take in and treat the venereal diseases. As soon as you stigmatize a hospital as a venereal disease hospital, then you label every person that goes in there and only encourage the secreting and concealing of cases, which really, in my judgment, defeats what we are trying to do, that is to encourage the reporting of the cases. Doctor Landis pointed out the extreme frequency of these cases in connection with houses of prostitution. I think in all cities where investigations have been made, both in Europe and on the Continent of America, it has been found there is a larger percentage of venereally-infected prostitutes among the clandestine prostitutes than among those in the houses, therefore we have got to go a little further than the houses of prostitution. Now then, in regard to the social side of it which Mr. Vieller wisely pointed out, I think that is extremely important. We are endeavoring to do that as fast as possible in Toronto. In all institutions receiving contributions from the city and handling indigent patients and indigent people generally, those institutions are required to investigate in regard to venereal diseases in them and see that they are treated. Under the Public Health Act we have got power to hold them in quarantine, inasmuch as they are suffering from a communicable disease that is prejudicial to public health. This is an intensely interesting problem that in our over-enthusiasm, waking up after so many years slumbering over this, it behooves us not to try to go too far, but we should go cautiously. Be sure you are right, then go ahead. We will now call on Doctor Evans to close the discussion.

DR. W. A. EVANS (*Chicago*): I want to second the motion made by Doctor Snow in offering his resolutions to provide for a committee to investigate this question. In that part of the paper which was not read I gave a considerable number

of state laws and ordinances that have been adopted in different parts of the country. Those laws and ordinances generally speaking are merely empowering laws, they do not discuss in detail, they do not establish the details for these campaigns. These laws generally have been passed within the last two years and coming from all parts of this country, to my mind it means quite clearly that public sentiment has been created strong enough to make it possible to pass laws. The time has come for health officers to do something. Preliminary, however, to activities on their part, there should be a period of study. That is provided for by this resolution offered by Doctor Snow. It is easily possible under these laws and ordinances, for they do not go into detail as to what shall be done. I did not give you the figures that are contained in my paper. They show that in the United States Army and the United States Navy the amount of venereal diseases within the last ten years has been cut just about in half. The reduction in foreign armies has been still greater and therefore it seems to me that in beginning our consideration of the subject, we should begin by giving careful consideration to the measures that have proven their efficacy when applied to armies and navies. At first we are made aware of the fact that many of the things that are possible in an army or in a military arm, are not possible in a free community. Therefore the first thing for us to decide is which of these measures can be applied to conditions in our communities and the next thing to decide is how shall they be applied? For instance, let us take this matter of the establishment of dispensaries. I believe that the New York Health Department, when they began their dispensaries, had in mind complete dispensary work; but they met with this opposition from the medical profession, so that they adopted a certain line of dispensary work that does not represent the full work usually done by dispensaries. I do not believe that there will be any immediate change in the sphere of activities of the New York dispensaries. I think that it will be a very good idea if other communities inaugurating venereal dispensaries would lessen the opposition by working along these somewhat limited lines. There is nothing to be gained by predicting what the future will hold. There is nothing to be gained really by prophesying what the future will hold. Start your dispensary along the lines that it was proven wise to start the New York dispensaries, and let the future work itself out. The same thing holds true, largely, of hospitals. I agree with Doctor Hastings and the conclusions of the Commission that venereal disease hospitals, labeled as such, will meet with serious discouragement, will labor under serious disadvantages. A better plan to pursue will be to strive toward a certain amount of hospital capacity for venereal disease cases in your community and allow the distribution of those beds to work itself out in the course of time. I have a paper on the subject of quacks and advertisements and advertising agencies and newspapers in relation thereto. It comes before the General Session a day or two later. I believe we have but two quacks left in the city of Chicago at the present time. They are not advertising; they cannot advertise in the papers. In my judgment, however, that does not reach the difficulty. The cure for quacks is more public information. Your New York Medical Society, Doctor Emerson, will not control the situation and no other legislative agency will put the quack out of business. The quack will go out of business when the people have enough of information so that they can form accurate opinions as to the offerings of medical men. When that information is generalized, the man that cannot meet the requirements will go out of business, will be forced out of business by economic considerations. He will not be forced out of business until such economic considerations operate. You gentlemen can easily remember when there were advertising doctors who advertised to cure a great multitude of ailments pertaining to, let us say, every part of the body. The limits of operation of these gentlemen have been circumscribed year by year until at the present time practically no quack is left except the quack who is practising on venereal diseases and those conditions that are closely allied thereto. And why? The quack was forced out of the consumption cure business when the people became educated as to consumption; he was forced out of the women's disease business when there was education along those lines; out of the Bright's Disease business when the people understood Bright's disease;

and when we have educated the people in relation to venereal diseases so that the man of the street can form accurate opinions as to the qualifications of those who make promises or offer guarantees, then and not until then will there be an end to the quack business.

Doctor Hurty: You lay great stress upon education; haven't you known doctors and medical students with these diseases, in spite of all their education?

Doctor Evans: Yes, sir.

Dr. Hurty: Then sometimes it fails.

Doctor Evans: There isn't any question about that.

Doctor Hurty: I would like to hear you discuss what effect the inculcation of virtue would have upon this disease.

Doctor Evans: Now I would take your time to discuss that if it were not for the fact that it has been discussed, I believe, very much better than I can discuss it, and I believe that it would be possible for those who are interested to get the documents in which it has been discussed. There is The Venereal Problem in the Army and Navy by Lieutenant-Colonel Kane, and the Judgment of Paris, by Lieutenant-Colonel Keau, issued by the medical department of the United States Army, which talks at length along that line and much better than I can discuss it, quoting particularly the views founded on the broad experience of the man who is a professional moralist, let us say, the present General in charge of the British Army—Kitchener's statement and Kitchener's argument and Kitchener's plea for morality would be more effective than any I could utter. Now about this matter of reporting cases, that is a very practical problem and I am sure it has weight with us. What are you going to do with the cases when you get them reported? That question is to be answered in several different ways. First what can be done tomorrow with the existing public sentiment, with the cases that are reported? The answer to that question will have to be based upon the circumstances that relate to that case. In the first place, you will find certain groups of people in such position that they can infect the maximum number of people, and for them there should be some action based upon that report. I refer particularly to infected prostitutes. Doctor Landis has spoken of one thing that might be done with them; Doctor Schenck of another, and I told you in my paper what we did with some of them a few years ago in Chicago. Public sentiment would justify us, in justifying certain communities in taking certain action with relation to that group. About three or four years ago it was the municipal policy in Denver, a very well thought out policy under the superintendent of police. Of course there still remains the very large group of people infected with venereal diseases who cannot be handled, in the present state of public opinion, as we now handle a man who, let us say, has smallpox. But let us see if there is any reason why we should not insist upon reporting, merely because we have not now nor do we see in prospect, a solution of the question of what is to be done with the reportable case? When we have the question of reporting come into our minds, we are liable to think at once of those conditions in which the word "report" is practically synonymous with the words, "complete control." For instance, yellow fever or smallpox or cholera. We lose sight of the fact that we, at the present time, require reporting of a considerable number of diseases, as to the further details of the handling of which we have not any particular unanimity of opinion in our action. For instance, measles—most communities require the reporting of measles; many communities get a fair percentage of their cases of measles reported. What do they do with the cases that are reported? That, as you know, is a very live question in England. Their policy differs radically from our policy by reason of the fact that they are not of an opinion as to what shall be done. I might go on, but I will cite just one and that is tuberculosis; what do we do with a case of ambulant tuberculosis that is reported? And yet there isn't any question at all but that we began our control of the tuberculosis situation by our provisions that demanded that the cases be reported, although when those ordinances were passed, were put in vogue, none of us had any idea as to what could be done or should be done with the cases of tuberculosis reported. A little while ago I heard the assistant corporation counsel of the city of Chicago say that venereal disease could not be made a reportable disease because it was not communicable, that it was not infectious,

that it was not contagious. If we do not do anything else by reporting these diseases, we will bring this group of cases out into the limelight, precipitate a discussion and out of that will come a method of improving the situation a little here, another little yonder and another yonder, and perhaps sometime or other we will have complete control of the situation. Now gentlemen, I desire to second the resolution offered by Doctor Snow because these ordinances and laws that have been passed—my general knowledge of the subject is quite convincing that we do need careful study and we do need standards of procedure.

DR. C. J. HASTINGS: There are two distinct phases of this problem; there is the social and the moral side of it, as has been pointed out, and then there is the communicable disease side. Now, in my humble judgment, if departments of health hope to efficiently handle this problem, they must absolutely divorce the preventive disease side of it from the moral and social aspect of it; there are other organizations that must handle it. If we begin by inquiring where and how you contracted every case and place emphasis on the social and moral side of it, we are going to defeat the very object we are trying to accomplish, so I think that it is extremely important. In connection with the Department of Health in Toronto, in all our general hospitals, we require them to have the cases of venereal diseases carefully handled and looked after. The Board of Health has been glad to supply their share, at least, of the cost of the salvarsan treatment of all these cases. I think we have got to go slowly and be absolutely sure of every step we take.

Doctor Snow's resolution was adopted.

A PORTABLE AIR SAMPLING APPARATUS FOR THE COLLECTION OF LARGE VOLUMES.

E. W. Brown,
P. A. Surgeon, United States Navy.

THE apparatus here described has been designed for the rapid collection in duplicate of relatively large volumes of air to be examined in the laboratory for such gases as carbon monoxide, hydrogen sulphide, oxides of nitrogen, etc. Minute amounts of these gases are of hygienic significance and the standard methods of analysis require the aspiration of large quantities of such air through appropriate absorbents. It is not practicable as a rule to make the analysis on the spot, particularly if the air is rapidly changing in composition, owing to the time required for aspiration and the special apparatus necessary to complete the analysis. A situation might arise, for example, in a sewer, in an engine-room or after gunfire in a turret aboard ship when it is imperative to take large samples speedily, so that a representative portion within a short-time interval may be obtained. The advantages of collection in duplicate are obvious. The present apparatus is designed to fulfil such requirements.

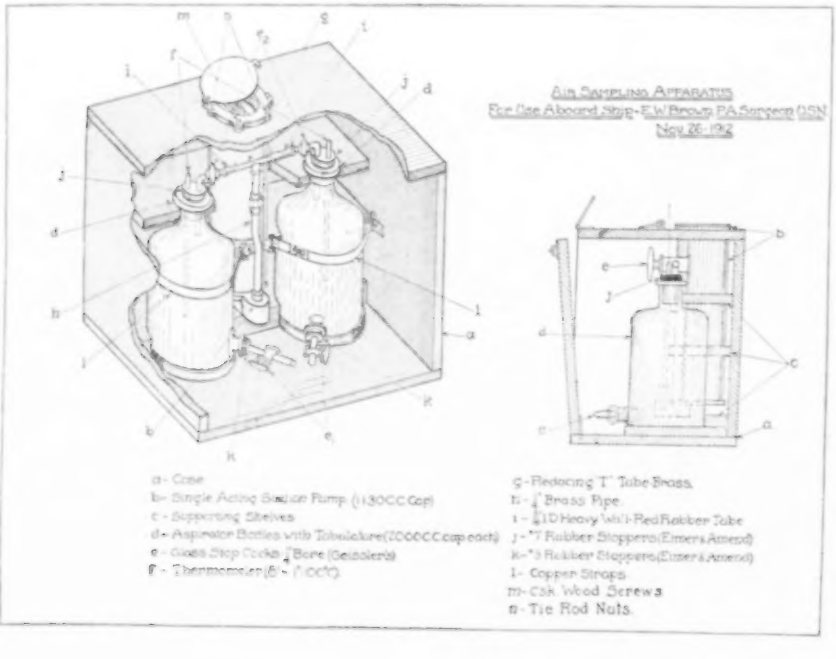
The apparatus is portable, protected against breakage under shipment, and air-tight. It consists of a wooden case 17 inches long, 12 inches deep and 14½ inches high, enclosing two glass bottles each of 2,000 cc. capacity, with gas-tight glass stopcocks, and fitted with a standard thermometer. The bottles are connected by glass and metal tubes with the inlet of a brass suction pump of special design. The writer has determined on the basis of a large number of tests that each stroke of the suction pump draws about 800 cc. of air through the two bottles at the rate of about 1 stroke per second. This was observed by connecting the two lower stopcocks to a gas holder and exhausting a definite quantity of air from the latter through the bottles with the pump. The course of the air in sampling is as follows: Through stopcocks e 1 to bottles, through stopcocks e 2 to the reducing T-tube g to h and to pump. The bottlers rest on felt pads and are held firmly in place by copper straps encased in felt. The rubber stoppers are carefully wired in place. The pump is readily accessible for interior inspection. There is an outside carrying case provided for shipment not shown in the sketch. This has a protective arrangement of springs at the bottom and also on the under side of the cover; the sides, cover and bottom are covered with very heavy felt padding. The inside case is therefore guarded against sudden jar in handling and no further packing material is needed. Thorough tests for tightness were made. There may of course be marked changes in pressure of the contained sample as a result of temperature variations; thus, a drop from 70 F. to 32 F. would entail a fall

in pressure of over 2 inches of mercury. The apparatus remained perfectly tight under a positive and negative pressure of 6 inches of mercury which is far in excess of any possible fluctuation.

Directions for sampling: Open stopcocks e 1 and e 2, give 20 strokes to the pump and close all stopcocks securely. If it is desired to sample from a place where it is impracticable to place the instrument, carry rubber tubing connections from stopcocks e 1 to the location specified.

Precautions: Securely wire all stoppers to tubulatures of bottles; lubricate all stopcocks and secure with rubber bands; wire all rubber tubing connections; inspect interior of the pump from time to time as to condition of valves.

The following question arises: How many strokes of the pump are necessary to obtain a representative sample of air? The combined volume of the two bottles is 4,000 cc. and the air displacement of the pump is 800 cc; thus in five strokes, 4,000 cc. of air would pass through the apparatus, but the sample would still be contaminated by a small residual portion of the original air. This question was tested by the following procedure: The sampling bottles were connected through stopcocks e 1 by rubber tubing of $\frac{1}{4}$ inch internal diameter with two openings into the interior of an air-tight respiration chamber of 300 feet capacity, the CO_2 content of which had been previously determined by a Haldane Gas Analysis Apparatus. A sample was then drawn from the


Air Sampling Apparatus
For Use Aboard Ship - E.W. Brown PA Surgeon USN
Nov 26 1942
a - Case
b - Single Acting Suction Pump (1130CC Cap)
c - Supporting Shelves
d - Aspirator Bottles with Tubulature (10000CC cap each)
e - Glass Stop Cocks 1/4" Bore (Geissler's)
f - Thermometer (0 - 100°C)
g - Reducing T Tube Brass
h - 1/4" Brass Pipe
i - 1/4 ID Heavy Wall Red Rubber Tube
j - #7 Rubber Stoppers (Eimer & Amend)
k - #3 Rubber Stoppers (Eimer & Amend)
l - Copper Straps
m - Oak Wood Screws
n - Tie Rod Nuts

chamber into the two bottles using a definite number of strokes with the pump, the stopcocks then closed and CO_2 estimated in each bottle by the Haldane Apparatus. The CO_2 percentage of the room and the number of strokes of the pump were varied from time to time. The data in the following table are typical of the results obtained. Each percentage represents an average of three analyses agreeing within .02 per cent.

It is concluded from the accompanying figures, that a minimum of 15 strokes of the pump are required to obtain representative sample; but 20 to 25 strokes are recommended to allow a proper margin of safety.

Air-tight room avg. CO_2 per cent.	Bottle 1 avg. CO_2 per cent.	Bottle 2 avg. CO_2 per cent.	No. strokes of pump.
.78	.73	.74	10
.24	.18	.20	10
.24	.20	.20	10
.26	.20	.21	10
.26	.19	.20	10
.52	.47	.45	10
.80	.81	.79	15
.57	.56	.56	15
.23	.21	.21	15
.24	.23	.22	15
.27	.25	.24	15
.24	.22	.23	15
.25	.25	.27	15
.27	.26	.25	15
.25	.25	.25	15

REFUSE DISPOSAL IN SOUTHERN CITIES WITH PARTICULAR REFERENCE TO SAVANNAH, GA., AND ITS NEW INCINERATOR.

E. R. Conant,
Chief Engineer, Savannah, Ga.

Read before the Laboratory Section, American Public Health Association, American Publication, Jacksonville, Fla., December 2, 1914.

THE production of waste is the result of living. This being true of the individual, is also applicable to communities. In small villages no difficulty is encountered in getting rid of the limited amount of refuse or waste that is thrown off. In congested communities it is a difficult problem, and the increasing demand for sanitary and efficient methods of disposing of waste is arousing intense interest. Public health is looked after more at this time than ever before, and anything that will eliminate the origin or spread of disease is immediately grasped at.

Waste disposal in the past has been, and in many cities is at the present time, carried on in a primitive manner. Consider for a moment the unsanitary, unsightly and objectionable refuse dumps, which are found on the outskirts of many of our cities. Those who have observed the familiar turkey buzzard hovering over a dump and devouring the putrid matter of same can speak of the unsanitary method of disposing of refuse by placing same in dump piles. These garbage dumps breed multitudes of the pest known as the household fly. Eminent medical men, at one time, advanced the theory that the continued dumping of refuse on lands adjacent to some South American cities was the cause of the frequent yellow fever epidemics and it is a fact that after the yellow fever epidemic in Florida in 1888, six southern cities in Florida and Georgia constructed what was then termed crematories, anticipating the destroying of refuse by these plants to be done in a sanitary manner. Again the refuse pile is the habitation of rats, the elimination of which, at this time, receives much attention. These garbage dumps located at one time outside of the city limits, may later on be the site for residential sections of the city, and the writer has in mind a city in Georgia, where a portion of the best residential section is located, which at one time was the dumping ground for the city's refuse, and only recently a fire occurring in a portion of the area gave much concern to some of the residents near by on account of the odor and smoke coming from same. Fire in a refuse dump can burn for a long period of time, and the discarded refuse dump at Savannah has been on fire continuously for two or three years, and is still burning.

Character of Refuse of Southern Cities.

The character of waste collected in southern cities differs materially from

that of cities in colder climates. The garbage of the South contains a very much larger percentage of vegetable matter than is found in northern cities. In Savannah, during the months of July and August of this year, an average of twenty tons of watermelon rinds were collected daily, which was 20 per cent. of the total weight of garbage and rubbish collected.

Far less meat is consumed in southern cities than in the North, with the result of a less percentage of grease to be found in the garbage than is found in garbage of colder climates. Of the total weight of garbage and rubbish collected in southern cities from 40 to 45 per cent. in weight is strictly garbage. In northern cities it is only from 12 to 15 per cent.

Rubbish is combustible to a large extent, and is partly used in the North for kindling fires and for fuel to a far greater extent than it is in the South, as a result the percentage of rubbish, while only 20 per cent. of the total amount of refuse collected in northern cities, is from 45 to 50 per cent. of the refuse collected in southern cities.

Ashes constitute from 70 to 80 per cent. of the total amount of refuse collected in the northern cities, whereas in the South it varies from 6 to 20 per cent. according to the location of the city in question.

Method of Refuse Disposal Adaptable to the South.

With the wide difference in the character of refuse found in a warm climate with that found in a colder one, it is to be expected that methods adaptable to the former would not be adaptable to the latter.

The reduction system in vogue in many of the northern cities, in the writer's opinion, cannot at the present time be made profitable and satisfactory in the South.

In the first place, the percentage of grease found in the garbage of the southern cities, as stated above, is far less than it is in the garbage of the North, and from reliable information received, the percentage of grease found in the garbage of the southern cities does not exceed 3 per cent. of the total weight of the household garbage, which percentage is too little to permit of the reduction system being carried on with profit.

In the second place, the reduction system requires a strictly separate collection of kitchen garbage, which at this time appears to be impracticable, on account of the non-dependable type of the household servants, which is almost exclusively colored.

Further, the reduction system requires expensive machinery and the operating cost is heavy, and with a large amount of refuse collected other provisions would have to be made for disposing of same.

In some cities of the North a large portion of the garbage is disposed of by feeding same to the swine, and while possibly this may be made sanitary and satisfactory under certain conditions, it cannot generally be followed, and is impracticable to be followed in the South, for the reason that it is impracticable to collect the garbage separately so as not to contain rubbish or ashes, and in the second

place in a warm climate the garbage decomposes and sours too rapidly for use as a food to hogs.

With the amount of rubbish in the refuse of southern cities, burning same gives a corresponding greater fuel value than is found in the refuse of the North, and with the modern types of incinerators or destructor plants, the burning of the garbage, rubbish and ashes intermixed without the addition of fuel is capable of evaporating water to the extent of from 1.3 pounds to 2 pounds from and at 212 degrees F. for every pound of refuse burned; thus it is seen that with proper plant a valuable biproduct, steam, can be obtained from destroying the city's waste by incineration and at the same time the refuse is destroyed in a sanitary and unobjectionable manner. This method of disposing of refuse at this time, especially in southern cities, is, in the writer's opinion, the most practical, most sanitary and least objectionable of any method now in progress.

I repeat that at this time, for we all recognize the fact, that this is a period of waste by the American people. Anyone who has closely inspected the refuse collected, observes waste that has occurred at the origin of the production of same. The time will undoubtedly come when the character of the waste of the American City will be different and conditions may call for different methods of disposal.

Method of Disposal now in Progress.

In order to ascertain the present method of refuse disposal in southern cities, letters of inquiries were sent out to the principal municipalities and thirty-nine replies were received. The questions asked were:

First: Population of city.

Second: Method of disposing of the city's refuse of the following classes: Garbage, rubbish, street sweepings, ashes.

Third: Have you in operation any crematory or refuse destructor. If so, please give type.

Fourth: Capacity of same.

Fifth: Which class of refuse does it destroy.

Sixth: Do you contemplate changing your method of refuse disposal.

These replies are incorporated in the tabulation attached.

Analyzing the information received, it is observed that three cities, Atlanta, Georgia, Montgomery, Alabama, and Savannah, Georgia, have in operation high temperature destructors of the Heenan-Froude type, all of which are so equipped as to furnish steam by the burning of refuse without the use of additional fuel.

Two cities have creamatories of the Dixon type; five garbage incinerators of the Nye Odorless type; one with incinerator built by the city, type not mentioned; three with creamatories, type not given and one with a gas furnace using natural gas.

Ten cities report that they are either constructing or contemplating the adoption of method of refuse disposal by incineration.

The method of disposing of each class of refuse is reported to be, as follows:

Garbage: Eleven cities place same in dumps; one has a reduction system;

one feed same to hogs; three burn same; eleven dispose of same with incinerators or crematory plants and two fail to report final disposition.

Rubbish: Thirteen dispose of same in incinerator or crematory plants; eleven dispose of same by placing in dumps; three burn same in open fires and two do not mention method of disposal.

Street Sweepings: Twelve cities dispose of same for fertilizer use; five burn same in incinerators or crematories; one dump the sweepings in river; nine dispose of same in dumps and three do not mention method of disposal.

Ashes: Two cities report that their ashes are burned in incinerators; the others dispose of same by filling holes in streets or raising streets or lanes or by placing same in dumps.

From the above analysis of the disposal of refuse in southern cities it is observed that the South is alive to the importance of the disposal of refuse in a sanitary manner, and while many of them have to adopt modern methods of refuse disposal, yet, I doubt if the proportion of cities in the South not employing sanitary methods is any greater than it is in any other section of the country. Those replies are tabulated on pages 915, 916 and 917.

Type of Refuse Collected, Method of Collection and Method of Disposal of same at Savannah, Georgia.

The population of Savannah is estimated at 80,000, of which practically one half is colored. The city occupies an area of approximately seven and one-half square miles. The streets are laid out in rectangular form, with a complete system of lanes, which provide for delivery to households and for the carrying away of waste. The city is comparatively flat, with forty-five miles of paved streets and lanes. The refuse of the city consists of: Garbage, rubbish, ashes, dead animals, street sweepings, sweepings from catch basins, night soil, sweepings from stables.

Rubbish and kitchen garbage is allowed to be placed in one receptacle and one combined collection is made of same.

Ashes must be placed in separate receptacles.

About 80 per cent. of the populated section of the city receives a daily collection of garbage and rubbish; the remainder every other day, with the exception of the extreme outlying districts, which receive bi-weekly collections.

The total annual amount of garbage and rubbish collected is 27,200 tons, of which approximately 12,500 tons are strictly garbage, which is approximately one pound per inhabitant per day. The cost of collecting and delivering same to the destructor plant is $2.29 per ton. This includes the maintenance of the teams and stock, the feed of stock, labor and new stock purchased during the year.

The question of the collection of ashes is of rather small moment. In winter time the daily collection would vary from 3 to 8 tons per day, according to the weather, and in summer time the amount collected is almost negligible. The ashes are used to fill depressions in sand streets. The collection for disposal of cinders from

manufacturing plants has to be looked after by the property owners, however, since the operation of the destructor plant it has proven advisable to haul a certain amount of cinder to the plant in order to increase the amount of steam and also during the months of July and August when the melon season is at its height to use a certain amount of cinder to increase the amount of combustible matter. Twenty tons of melon rinds per day contain an excessive amount of moisture and with the addition of a certain amount of cinders with other rubbish, this waste is reduced without serious difficulty to inorganic matter. It has been found that the cinders from manufacturing plants collected contain from 15 to 20 per cent. of fuel and each ton furnishes about 2,500 B. T. U.; then again the use of cinders assist in forming more vitrious clinker which increases its value for road foundation or concrete material.

Dead animals are delivered to a rendering plant operated by a private party and the city receives a revenue from same.

Street sweepings are sold, producing a revenue to the city.

Sweepings from catch basins are taken to low ground outside the populated section of the city, and it has been found that no objection has been raised to this method of disposing of same.

The city at this time has about 1,500 vaults and cesspools, the cleaning of which is regularly done by private parties who have a contract with the city, and night soil is taken outside of the city limits and used for fertilizer purposes. With the construction of the extension of the sewerage system, which is now going on, the vaults will be practically eliminated.

The sweepings from city stables are sold.

The refuse taken to the destructor plant consists of household, hotel and restaurant garbage; rubbish from households, hotels, stores and warehouses; paper that is collected from paper boxes and rubbish cans. The city furnishes large wooden boxes to stores, restaurants, hotels and theatres in which paper, excelsior and light material is placed.

Description of Savannah's High Temperature Destructor Plant: Method and Cost of Operation.

Savannah recently completed the construction of a high temperature destructor, which has been in continuous operation for nine months, in fact, from the date that it was completed on March 23, 1914. The period of operation has been long enough to thoroughly test its efficiency. The destructor is of the Heenan-Froude type, and was constructed by the Destructor Company of New York.

The destructor has a daily capacity of destroying 130 tons of mixed refuse, consisting of garbage, rubbish and ashes and stable sweepings.

The disposal of carcasses, street sweepings and stable sweepings is done with revenue, and it is not contemplated that this portion of the city's refuse will be destroyed at the destructor, although the plant is capable of disposing of this waste.

The writer in studying the various methods of disposal of garbage and the various types of destructor plants recommended to the city a plant that would result in generating as much steam as possible from the burned refuse without auxiliary fuel, and with this in view the plant was constructed adjacent to the city water works pumping station on property belonging to the city. The distance between the walls of the destructor plant and the pumping station is only 60 feet, and steam is conveyed direct through pipe from the destructor to the steam header in the boiler room of the water works. The close proximity of the refuse disposal plant might be considered objectionable, if not dangerous, but at no time since the plant has been in operation has the pumping station received any odor what-so-ever, nor have there been any objectionable features whereby the water supply is in the least endangered.

In the destructor plant there are two 65-ton capacity per day Heenan type furnaces. Each unit comprises four cells about 28 inches wide on the bottom, 34 inches at the top, 16 inches deep, 8 feet long.

Each unit has a separate large combustion chamber, a 200 horse-power Wickes water-tube boiler and air heater and centrifugal fan for supplying forced draft. The cells are fitted with trough grates, which is a comparatively recent development, but is already quite extensively used in plants constructed by this company and by Heenan-Froude, Ltd., Manchester, Eng., who made the original design. The contract also covered a building to house the plant, a storage pit of 260 cubic yards capacity for receiving the refuse, a regenerator or preheater, electric hoist for taking the material from the storage pit and transferring it to the containers, necessary instruments for measuring and recording conditions of the furnaces, a steam turbo or engine driven generator of 75 k w. for supplying the necessary current for lighting the plant and operating the motor. The cells are so constructed as to have a burning area over each grate of 20 square feet, each boiler to have a heating surface of 2,000 square feet with a working pressure of 160 pounds per square inch. The stack, of radial brick construction, is 150 feet high and 6½ feet inside diameter at the top. The receiving storage pit as constructed in this plant has advantages over some that have been observed at other plants. It is 32 feet long, 20 feet deep and 11 feet wide. The greatest length is parallel with the beam supporting the crane carrying the hoisting grab bucket, and the bucket can reach any of the material in the pit by direct drop, without extra handling in the pit. Then again, the bucket can pick up any portion of the refuse dumped in the hopper and distribute it over the surface if desired, to bring about a better mixture. The combustion chamber is of ample capacity and properly proportioned to receive and thoroughly mix and burn all gases coming from the different cells discharging into it. There is ample space for the collection of dust in the chambers and a door to same is large enough to permit the entrance of dead animals.

A superheater, of the Foster type, superheats the steam generated by the boiler. The air heater is located immediately at the rear of the boiler. The supply of air for forced draft is taken from the ventilating system in the building. The containers into which the material is deposited from the grab bucket are arranged one over each cell of the furnaces. Each has a capacity of about one cubic yard and they are closed by horizontal sliding doors built into two parts. Each cell receives charges of about one cubic yard. The space above the grate is common to each cell and to the combustion chamber, so that there is free interchange of heat between cells. The main grates on which the combustion takes place are of heavy cast iron construction. They are perforated with a sufficient number of holes to give proper distribution of air throughout the refuse and at the same time to secure the maximum cooling effect on the iron supports. The clinker car is of special design to receive the clinker as it is withdrawn from the furnaces.

Guarantees.

The plant shall be capable of destroying under normal operation, without additional fuel, 130 tons of refuse in 24 hours. No odors or obnoxious gases shall escape from the chimney or the building. That at no time during the normal operation of the plant shall the temperature fall below 1,250 degrees F. and that an average temperature of 1,500 degrees F. shall be maintained in the combustion chambers. That the number of pounds of steam generated in the boiler from and at 212 degrees F. per pound of refuse consumed shall not be less than 1.3 pounds of refuse consumed. That the net effective boiler capacity in horse power for steam utilization over and above that required for operating the plant shall be 330 horse-power, based on 34.5 pounds per boiler horse-power. The cost per ton for the incineration based upon the schedule of wages to be paid and with force as required and set out in the specification shall not exceed 40.4 cents per pound. Another important guarantee is as to the number of pounds of refuse to be burned per hour per square foot of grate area upon which final combustion takes place. In this plant it is guaranteed not to be less than 68 pounds, which is a reasonable guarantee.

Cost of Plant.

As stated above, the plant was constructed on city property, so that there was no cost to the city for a site.

The total cost for the plant, including all extras, steam connection with the pumping station, clinker platform, etc., was $126,271.

Operation.

All refuse brought to the plant is weighed and then dumped into the storage hopper at the ground level. It is taken from the hopper by a grab bucket operated by an electric transporter and delivered to the containers, one of which is located over each cell of the furnaces. At the bottom of the containers is a solid door operated hydraulically, operating of which is

done on the stoking floor, which enables the stokers to fill their grates in accordance with the requirements of their fires.

Stokering is done through a supplementary door, which avoids the necessity of opening the large door through which the clinker is withdrawn.

The clinker formed on the grate is removed by semi-mechanical means. The sides of the grates diverge slightly from the rear to the stoking door. There is a large bar to which is fastened a plate which forms an upturned hoe laid on the bottom of the grate before the first charge is dropped upon it, and the clinker is pulled out bodily by power obtained from a hydraulically-driven winch onto a hand-pushed car, which is pulled over a level paved surface to the dump. This method of clinkering permits of the clinker being removed from the grate in from three to four minutes. The platform at the dump is on the same level as the stoking floor and the clinker is dropped over a vertical wall. While withdrawing the clinker, regulating valves are operated so as to shut off the air supply coming from the air heater.

One great advantage of the furnaces at this plant over the furnaces constructed at some other cities is that a deep fire is maintained, which enables the wet portion of the refuse to be more thoroughly dried and destroyed than in shallow grates. In my opinion, the success of this plant is partly due to this particular feature.

The average time of burning charge is 20 minutes. Usually six charges are made for each clinker produced on the grates. When the plant is working at its full or nearly full capacity the labor required is operated in three shifts of eight hours each. With the destruction of from 60 to 75 tons of garbage only one unit is used with three shifts of labor. This is better than to use two shifts, working both furnaces, for a more even supply of steam is delivered to the pumping station.

During July and August, when the delivery of watermelon rinds delivered to the plant averaged 20 tons daily, this amount of extra wet garbage, bringing the percentage of garbage above the guarantee is only destroyed by adding dry material, which has sufficient heat units in same to offset the excessive moisture in the garbage. This is brought about by adding about 10 per cent. in weight in cinders collected from manufacturing plants. With the addition of these cinders, complete combustion of the garbage is obtained.

From the day the plant commenced to consume the garbage on March 24, 1914, to the present date, all of the refuse delivered to the plant has been consumed and none had to be hauled away. The amount saved in fuel at the water work plant from April 1 to December 1 was approximately $4,500.

If the refuse delivered to the plant equals the capacity of the plant, sufficient steam will be furnished to operate the pumping station entirely and an annual saving of approximately $12,000 would ensue to the city.

The pumping station has two ten-million duplex compound Holly Gaskill

pumping engines and two cross-compound air compressors, all of which are operated condensing. The steam pressure carried at the water works plant is 90 pounds, but at the destructor plant is carried up to 150 pounds, with 100 degrees superheat. The pressure, however, is reduced by passing through a reducing valve on the main steam header in the boiler room at the water works.

The total amount of refuse consumed from March 24, when the plant was completed to November 30, was 18,700 tons, an average of 68 tons daily. The total cost for operating the plant for destroying garbage was $10,900, or a cost per ton of 60.2 cents. Allowing for the saving of fuel at the pumping station, for this period, amounting to 24 cents per ton destroyed, the net cost for destryoing the refuse was 36 cents per ton.

The percentage of clinker obtained from destroying the refuse varies from 20 to 30 per cent. of the total of refuse burnt. During the season when the refuse is dry, the weight of the clinkers is from 20 to 25 per cent. During July and August this varies from 25 to 30 per cent. The clinker is now being used for road building and raising low lots and it is estimated to have a value equal to the cost of removing same from the plant.

The cost of destroying the refuse, the amount of evaporation of water, and steam obtained is based on the refuse having the following percentages of material:

45 per cent. garbage;
40 per cent. rubbish;
10 per cent. ash or cinder;
5 per cent. manure by weight;

the garbage to consist of organic material, vegetable and animal with water and grease; rubbish to consist of paper, rags, excelsior, straw, glass, etc.

Labor Required to Operate.

Labor for each shift with plant working at full capacity requires one man to feed hoppers, four stokers, one engineer, one craneman for each shift of eight hours, making the total labor charges per watch $17.50 or $52.50 per day of twenty-four hours. This, however, is not adhered to, and with the amount of refuse destroyed, viz.; 68 tons daily, except in the vegetable and melon season, the cost of labor is $44 per day of twenty-four hours.

Tests.

The plant was operated for five months before it was accepted by the city and final payment was made to the contractors, in order that its operation could be watched for a reasonable length of time, and also to observe if any weakness would develop requiring changes. There were also three tests made under conditions that would enable the city to ascertain whether the plant could work to its guaranteed capacity and whether it would fulfill all of the requirements of the contract and specifications.

The details of the final test are given on p. 913, and it is observed that the plant exceeded the requirements of the specifications and contract in the test. It has also worked efficiently through-

out the period that it has been in operation. No obnoxious odors emanate from the stack or building. Under normal operation of the plant the temperature in the combustion chamber averages about 1,700 to 1,800 degrees and at times it is necessary to wet the garbage and rubbish before it is taken to the furnaces, in order to keep the temperature below 2,000 or 2,200 degrees. To permit of a higher temperature might endanger the lining of the combustion chamber. The water evaporation exceeds by about .2 of a pound the guaranteed evaporation.

The writer highly recommends the disposal of refuse of southern cities by high temperature incinerators, and he further considers the revenue derived from the burning of garbage, rubbish and ashes mixed sufficient to warrant the design of a plant that will generate steam and to use same for commercial purposes.

While the disposal of waste by incineration has made rather slow advancement, with the elimination of some of the crude and visionary plants that have in the past been constructed in some of the cities, and with a better system for ascertaining the amount and character of refuse of cities it is certain that with the construction of reliable types of furnaces and destructors will advance the adoption of a sanitary method of refuse disposal.

RESULTS OF TEST OF HEENAN DESTRUCTOR AT SAVANNAH, GEORGIA AUGUST 21ST–22D, 1914.

Duration of Test: 3 a.m. 21st–12.30 a.m. 22d, 21½ hours.
Type of refuse: Garbage, 45 per cent.; rubbish, 40 per cent.; manure, 5 per cent.; ash, 10 per cent.
Type of destructor: Two. Four trough grate furnaces with forced draft.
Number furnaces at work: Two.
Total grate surface: 160 square feet.
Type of boilers: Wickes' Vertical Water Tube equipped with Foster Superheaters.

		Builders guarantee.
Total heating surface of each boiler	2,000 sq. ft.	
Total refuse burned: 13,877 tons or	277,550 lbs.	
Total refuse burned: per hour	12,909 lbs.	10,833 lbs.
Total refuse burned per sq. ft. grate surface per hour	80 6 lbs.	68 lbs.
Total clinker and ash: (Approx.)	68,608 lbs.	
Percentage of clinker and ash to refuse burned	24 7%	
Maximum combustion chamber temperature	2,000°F.	
Minimum combustion chamber temperature	1,700°F.	1,250°F.
Average combustion chamber temperature	1,845°F.	1,500°F.
Average steam pressure (gauge)	120 lbs.	
Average temperature of steam	523°F.	
Average superheat	173°F.	100°F.
Average temperature of feed water	206°F.	
Total water fed to boiler	397,162 lbs.	
Total water evaporated from and at 212°F.	450,382 lbs.	
Total water evaporated per pound of refuse	1 62 lbs.	1 3 lb.
Water evaporated per pound of combustible	2 15 lbs.	

		Builders guarantee
Total B.H.P. developed per hour	607 lbs.	
Estimated h.p. used in plant for 75 k.w. non-condensing, turbo generator set and boiler feed pump	118	
Excess B.H.P.	489	330
Average air pressure under grate	3½ in.	
Average air temperature	252° F.	
Average stack draft	.72 in.	
Average Co. 2	11.43%	
Total number charges, both furnaces	447	
Average weight of charge	621	
Total number clinkers drawn, both furnaces	64	

Cost of Operation Based on Contract

Hoisting: One man per shift of eight hours at	$2.40	$2.40
Stoking, four men per shift of eight hours at	2.40	9.60
Clinker removing, one man of eight hours at	1.50	1.50
Engineer, one engineer of eight hours at	4.00	4.00
Total labor charges per shift		$17.50
Total labor charges per day of 24 hours		852.50
Total labor charges per ton at 130 ton rate		.404

Cost of Operation Based on Actual Cost

Hoisting, one man per shift of eight hours at	$2.25	$2.25
Stoking, four men per shift of eight hours at	1.75	7.00
Clinker removing, one man of eight hours at	1.50	1.50
Engineer, one engineer of eight hours at	4.00	4.00
Total labor charge per shift		$14.75
Total labor charge per day of 24 hours		844.25
Total labor charge per ton at 130 ton rate		.340
Total labor charge per ton for 138.75 tons in 21½ hours		.318

Remarks.

Test made with running start. All hoppers were empty, and then charged with test mixture. On completion of test, hoppers were empty. All Combustion Chamber Temperatures taken with Thermo-Electric. Recording Pyrometer. All other temperatures were taken with Mercury Thermometers. Water measured with a Worthington Hot-Water Meter. Steam Pressures taken with a recording pressure gauge connected with main steam line. Steam delivered to main header at Water-works, and used to operate one 10,000,000 gallon pumping engine and one 1850 cu. ft. Cross Compound Condensing Air Compressor. From 12:15 to 5:10 P.M. 10,000,000 gallon pump speeded up. Steam from plant also used to operate all prime mover units used for generation of power for use in plant. At 7:00 A.M. of August 22nd, all refuse in storage pit was burned, and from then until 8:00 A.M. insufficient refuse was delivered to keep the plant going at capacity.

Weather during test was hot and humid, with occasional showers. Test was started at 3:00 A.M. of 21st and completed 12:30 A.M. of 22nd. All calculations based on A.S.M.E. Standards. Safety valves of boilers were popping off from 5:30 P.M. until 6:30 P.M.

REFUSE DISPOSAL IN SOUTHERN CITIES.

City.	Method of disposing of city's refuse.				Crematory or incinerator. Type and capacity.	Contemplating any change.
	Garbage.	Rubbish.	Street sweepings.	Ashes.		
Ashville, N. C., 34,000	Delivered out of town in covered receptacles	Burned at incinerator	Hauled to concrete pit and sold to farmers	Fill gulleys and make fills, etc.	Incinerator, Dixon type. 30 tons day of 24 hours	No
Athens, Ga., 20,000	Burned in open fires	Burned in open fires	Placed on city farm	Carried to remote places where not objectionable	None	
Augusta, Ga., 50,000	Hauled to dump outside of city limits	Hauled to dump outside of city limits	Hauled to city convict farm	Hauled to dump	None	Yes. Will put in incinerator
Beaumont, Tex., 31,000	Burned daily	Burned daily	Burned daily	Burned daily and used for filling in low places in city	Incinerator in process of construction. Nye Odorless	Not at present
Bessemer, Ala., 18,000	Dump	Dump	Used on city park	Used in repairing alleys	None	Not at present
Birmingham, Ala., 175,000	Incinerator	Incinerator	Hauled to dump	Making walks on muddy streets	4 incinerators. Constructed by city. 40 tons per day each	Not at present
Charlotte, N. C.	Crematory	Crematory	Sold to parties	Hauled to ground near crematory	Old style crematory. 20 tons per day	Yes. Incinerator

REFUSE DISPOSAL IN SOUTHERN CITIES.

City.	Method of disposing of city's refuse.				Crematory or incinerator. Type and capacity.	Contemplating any change.
	Garbage.	Rubbish.	Street sweepings.	Ashes.		
Chattannooga, Tenn.	Dump	Dump	Dump	Dump	Dump	Contemplate installing incinerator in near future
Covington, Ky., 65,000	Burn same	Dump	Dump	Dump	Gas furnace	Not at present
Durham, N. C., 20,000	Carts	Carts	Carts	Carts	Nye Odorless in process of construction	Not at present
Montgomery, Ala., 50,000	Incinerator	Incinerator	Used as fertilizer by farmers	Incinerator	Heenan Froude	No
Paducah, Ky., 25,000	Burning	Dumping	Dumping	Dumping	None	Yes
Raleigh, N. C., 25,000	Crematory	Crematory and clay streets	Crematory	On clay streets, and rolled	Nye Odorless	No
St. Augustine, Fla., 5,000	Dump	Dump	Dump	Dump	None	
Selma, Alabama, 15,000	Dumped			Dumped	None	Yes when money becomes obtainable
Sumter, S. C., 10,500		Burned near city limits	Used on city farm	Generally disposed of on premises	None	
Tampa, Fla., 60,000	Incineration	Incineration and dumping	Burned	Used for covering dump	Dixon. 100 tons 24 hours, in 4 units	Not at present
Winston, N. C., 35,000	Hauling it away				None	Yes
Waycross, Ga., 18,000	Incinerator	Incinerator	Used on city farm	Used on city farm	Nye Odorless. 15 tons	No

REFUSE DISPOSAL IN SOUTHERN CITIES.

City.	Method of disposing of city's refuse.				Crematory or incinerator. Type and capacity.	Contemplating any change.
	Garbage.	Rubbish.	Street sweepings.	Ashes.		
F. Worth, Tex., 94,000	Hauled away by contract	Hauled away by contract	Hauled away by contract	None	None	Yes, in near future
Pensacola, Fla., 25,000	Incinerated	Incinerated, filling, etc.	Parks and squares	Filling low places, etc.	Yes. Nye Odorless Crematory. 8 to 10 tons each 12 hours	No
St. Louis, Mo., 800,000	Reduced for by products gasoline system	Hauled to public dumps such as quarries, etc.	Dumped in the river	Hauled to low property outside city and dumped in old quarries	None	Present contract to run four years
Shreveport, La., 40,000	Crematory	Sold and crematory			Crematory	
Savannah, Ga., 80,000	Incinerator	Incinerator	Sold	Used for filling streets	High temperature incinerator	No
Charleston, S. C., 59,000	Dump	Dump	Dump	Dump	None	Studying system of incineration
Mobile, Ala., 58,000	Dump	Dump	Dump	Dump	None	No
Jacksonville, Fla., 58,000	Fed to hogs	Sold and dumped	Dump	Dump	Crematory not in use	Yes
Atlanta, Ga., 155,000	Incinerator	Incinerator	Incinerator	Incinerator	High temperature incinerator	No
Columbus, Ga., 20,000	Dump	Dump	Fertilizer	Dump	None	Installation of incinerator next year

REPORT OF THE COMMITTEE ON WATER SUPPLIES OF THE SANITARY ENGINEERING SECTION

FRANCIS F. LONGLEY, *Chairman.*

Read before the Sanitary Engineering Section of the American Public Health Association, Jacksonville, Fla., December 4, 1914.

THE Council of the sanitary engineering section in nominating this committee some two years ago stated that the functions of the committee would be to select suitable fields for committee work, and be prepared to suggest the most important topics which they believed to be suitable for committee action. No special committees have been appointed by the Council to deal specifically with any of the topics suggested. On the other hand, the instructions to the committee this year were to take up and consider any special phase of the broad topic of water supplies, and to present reports preliminary or final in character on special or particular aspects of the field of activity which they have been appointed to consider.

The report of last year's committee is contained in the December, 1913, number of the AMERICAN JOURNAL OF PUBLIC HEALTH. Several of the features of water supply development mentioned in that report were merely chronicles of the present status of those phases of water supply, and little perhaps can be added to them at the present time. Others, such as those two features relating to decolorization of water, are relatively new developments, and the thing which is most to be desired in connection with them is the application of these principles in actual practice and the recording of the results of such application.

It appears to this committee that the subject that will be most fruitful for our study and report and which will be of most value at the present time, is the disinfection of water, which was touched upon briefly in last year's report. The committee has no reports to present upon any other subjects.

Disinfection has come to be looked upon universally as an important part of water purification processes. Its development has been recent and rapid. A great amount of evidence demonstrating its efficiency and economy has been obtained and much has been written on this line from time to time.

The following matter of this report is the result of an effort to bring together as much as possible of this information and to study it with a view to giving the results in the most useful form to this association.

So many new developments in disinfection processes are being made from time to time, that a report of this kind cannot be considered in any sense final, but merely a report of progress to the date of writing.

Inquiries for Disinfection Data.—For this study the committee has circulated a large number of inquiries. A list of questions was prepared intended to cover the field of disinfection

as fully as was consistent with the purposes of the committee. A list of the water supplies in the United States and Canada in which some disinfection method was known or believed to be used, was prepared from all available sources. The hearty coöperation of engineers, health officers and others who were appealed to in this matter, was secured, but there can, of course, be no assurance that the list was complete. The committee appreciated the fact that lists of questions of this kind are not popular, but they had all been live questions with many waterworks superintendents and engineers, and therefore, the circulation of a questionaire seemed to be the most fruitful way of securing the information wanted. These inquiries were sent out then to all the cities named in said list, the total number being about 240. Of these the committee received replies from about 110, or nearly one half of the total number of inquiries. These replies represent in the aggregate, water supplies of somewhat more than 2,000 million gallons per day.

Kinds of Water Treated.—About 75 per cent. of the supplies for which replies were received, are river waters. About 20 per cent are from lakes, and the small remainder are ground waters.

Methods Used.—Of all the replies received by the committee, about 80 per cent. are stated to use or to have used hypochlorite of lime, and the balance, liquid chlorine.

Upon the use of ozone and ultra-violet rays as disinfecting agents for water supplies, but little more can be said at the present time than was stated in the report of this committee last year. In brief, the results of laboratory experiments with these agents are promising, but there are practical difficulties that are hard to surmount to make them compare favorably with the methods in common use. The replies to the inquiries of the committee do not indicate any tendency towards their more general application.

The use of liquid chlorine began so recently that but little of the data received relates thereto. The matter that follows, therefore, relates generally to hypochlorite, unless something else is clearly indicated.

Increase in Use of this Treatment.—The first application of hypochlorite noted among the replies was in 1908, in which year disinfection by this means was begun at the Bubbly Creek plant in the Union Stock Yards in Chicago, at the Boonton Reservoir of the Jersey City supply, and upon the municipal water supply of Poughkeepsie, New York. The several years following showed a rapid increase in the number of installations, although the records for 1913 indicate a falling off. The returns for the year 1914, of course, are incomplete. Of the total installations regarding which replies were received, the percentages installed each year have been as follows:

	Gallons per day.
13% in 1909, representing a total of	100 million
14% in 1910, representing a total of	450 million
22% in 1911, representing a total of	320 million
22% in 1912, representing a total of	710 million
18% in 1913, representing a total of	70 million
8% in 1914, representing a total of	265 million

Use and Point of Application.

A question was proposed with the idea of finding what the practice was as to the point of application of the treatment. Some 37 per cent. of the cities replying use a disinfection without other treatment, and the balance use it as an adjunct to some treatment, filtration in most cases. In 57 per cent. of those cases in which it is used as an adjunct to filtration, it is used as a final treatment; in 26 per cent. it is used after coagulation or sedimentation and before filtration; in the remaining 17 per cent. it is applied before coagulation and filtration.

The data at hand do not give any reasons for the application before coagulation. In general, an effective disinfection may be secured with a smaller quantity of hypochlorite, if it is applied after rather than before filtration. It should be noted that the storage of chlorinated water in coagulating basins, and its passage through filters, tend to lessen tastes or odors contributed by the treatment, and this fact may in some cases account for its use in this way.

Beyond this, there is nothing in the moderate amount of bacterial data secured in connection with this work that enables the committee to generalize upon the relative advantages of these different points of application.

Supervision.

About 45 per cent. of the replies indicated supervision of the treatment by a chemist or other technically qualified person.

Application.

The application of the disinfection treatment is in most cases continuous; only about 10 per cent. of the replies indicating intermittent application.

Cost of Hypochlorite.

As might be expected, the cost of hypochlorite varies widely in different cities. The data indicate that two factors are mainly responsible for the variations in the cost: First, the distance it has to be transported, and second, the quantity purchased in a year.

In the eastern part of the United States as far west as to include part of Ohio, the average cost is $1.45 per hundred pounds. From that point west to the Mississippi River or thereabouts, the average cost is $1.78. From there west to include about Kansas and Colorado, the average cost is $2.60. West of that the average cost is about $3.00. There are a number of points in the south where unusually high prices are paid for hypochlorite of lime.

Taking all the data as they stand, plants having a capacity in excess of twenty-five million gallons per day pay an average of $1.46. Those having capacities from ten to twenty-five million pay an average of $1.64. Those with capacities six to ten million pay $1.78. Those with capacities three to six million pay $2.33. Those with capacities one to two million pay $2.53, and those with capacities less than one million pay $2.84 per 100 pounds. The variations

within each one of these classes are of course large.

An interesting point presented itself in the increased prices a number of cities report having to pay for hypochlorite since the beginning of the European war. Eight cities report such an increase, which has ranged from a minimum of 45 per cent. to a maximum of 240 per cent. and has averaged 92 per cent. The evidence in some cases indicates that the price of hypochlorite had made a large advance before the war broke out, and the war, therefore, may not be the cause of the increase.

Total Cost of Apparatus.

An analysis has been made of the total cost of equipment for disinfection by means of hypochlorite. The cost per million gallons varies widely, and does not seem to bear any very close relation to the capacity of the equipment. It is true that the greatest cost per million gallons capacity, namely, $2,400, was for a plant of only 0.5 million gallons per day, nearly the smallest capacity; and the smallest costs per million gallons capacity, namely, $4 and $6, were for plants of fifty million and fifteen million gallons capacity, respectively. The wide variations in cost are not consistent with these, however. For instance, there is a cost of $12 per million gallons for a capacity of less than one million gallons per day, and a cost of $416 for a capacity of twenty-four million gallons per day.

These variations are accounted for by the fact that the designs vary widely; some are the merest makeshifts, while others are elaborate; some of the costs quoted include no building costs, while others include expensive structures. Taking the figures as they stand, not including the liquid chlorine plants, the total costs per million gallons are stated not to exceed $25 in 12 per cent. of the supplies, $50 in 30 per cent.; $100 in 42 per cent.; $250 in 67 per cent., and $500 in 87 per cent. of the supplies under discussion.

Total Cost Per Million Gallons.

The total cost per million gallons for the process also varies widely. By far the greater number of costs stated lie between 10 and 50 cents per million gallons, the average for these being about 25 cents.

The data are not full enough nor accurate enough for a comparison of the costs of disinfection by means of hypochlorite and of liquid chlorine.

The Quantity of Hypochlorite Required.

The maximum quantity of hypochlorite stated is 60 pounds per million gallons, this is at the Bubbly Creek plant in Chicago, and the nature of the water treated is well known to require a large dose. There is one other case recorded of a maximum requirement of 60 pounds per million gallons. For a water of extremely high color this is perhaps to be expected. The lowest maximum quantity stated is 4 pounds per million gallons. The average of all the maximums stated is 17 pounds per million gallons.

Bubbly Creek again shows the high-

est average dose of 55 pounds, the next highest is 35 pounds, and the lowest average dose stated is 3 pounds. The average of all the averages stated is about 11 pounds per million gallons.

Judging from the information—or lack of information—received in response to those inquiries bearing upon the relation between quantity of hypochlorite required, and color or turbidity in the water, it seems to your committee that a surprisingly small amount of attention is given in the various cities to following out this relationship. A knowledge of this relation is important, as it influences the quantity of hypochlorite that is required for a given water, the quantity that may be applied without producing objectionable tastes, and the economy of the treatment. The reason for the lack of attention may perhaps lie in the fact that the cost of the hypochlorite required for any water is trifling; and it is not of great importance just what quantity is applied, so long as it is enough, on the one hand, to give good bacteriological results, and on the other hand, not so much as to produce objectionable tastes or odors.

Storage after Treatment.

The matter of storage of the treated water before going into the city mains is of interest. It is generally considered desirable to have some storage, in order that the disinfecting agent may have adequate time to reach its full effect before the water goes to the consumer, and to permit the dissipation of tastes or odors contributed by the treatment.

Forty per cent. of the supplies about which we have information have no storage after treatment; 18 per cent. of them have less than one hour; 9 per cent. of them have from 1 to 3 hours; 5 per cent. from 3 to 12 hours; 11 per cent. from 12 to 24 hours and 17 per cent. have more than 24 hours.

Tastes and Odors.

An effort was made to ascertain the conditions under which any objectionable tastes or odors were noticed. An analysis of the data sent in answer to this question, shows that in one place a maximum dose as great as 37 pounds per million gallons has not given rise to objectionable tastes or odors, and in numerous places 20 to 30 pounds have not been noticeable. The average amount stated for which no odor or taste was noticed was about 14 pounds per million gallons. The supplies in which it was definitely stated that no tastes or odors were noticeable included about 40 per cent. of the total. Among the others there were general comments as to the occurrence of objectionable tastes or odors in various forms, but in the main indicating that they are likely to occur with changes in the character of the water treated, especially at times of storm or freshet.

So far as is indicated by the somewhat incomplete data in hand, the largest quantities of hypochlorite are used in those supplies in which the color or turbidity of the water are highest. The absorbing effect of turbidity or coloring matter upon hypochlorite has long been recognized. It finds confirmation in the data at hand,

although unfortunately these are not complete enough to enable the committee to establish any definite relationship between color, turbidity and quantity of disinfecting agent that may be used without objection.

Materials Used.

The replies indicate that the commonest construction of tanks for hypochlorite is concrete. Some 47 per cent. of the supplies under consideration have concrete tanks, and about 20 per cent. in addition thereto have wood or iron tanks lined with concrete or cement mortar. Something more than 20 per cent. are of wood without lining. The balance are either wood with lead lining, wood or iron with some protective or acid resisting paint or porcelain lining. The liquid chlorine is universally contained in special iron cylinders.

The piping seems in the general case to have been put together of the materials most easily available without regard to corrosion. Fifty-six per cent. of the replies indicate the use of iron pipe either black or galvanized. Fifteen per cent. use lead pipe and about an equal number use brass. A few use lead-lined iron pipe, cast iron pipe, hard rubber, rubber hose, bronze or copper pipe.

The same comments apply to the kind of valves and fittings commonly used. Sixty-six per cent of those are of brass, such as are usually found in stock. Some fourteen per cent. state that bronze valves and fixtures are used. It is possible that some of these upon further inquiry might prove to be brass. A few use iron valves or fittings and a few have fixtures made of vulcanite, rubber composition, copper, lead, glass, etc.

The materials which seem to have shown the greatest resistance to the corrosive effects of the disinfecting agent are concrete tanks, lead pipe and rubber composition. Several of the answers indicate that copper, cast iron, and lead-lined iron pipes are used without corrosion and a number indicate too that brass and galvanized iron are used without corrosion. The evidence as to these two last materials is, however, contradictory, as other answers indicate considerable corsion with galvanized iron and brass. It seems likely that the quality of the material and some peculiar local conditions may perhaps be determining factors in the corrosive effect upon these two materials. The data show the unmistakable corrosive effect upon wrought iron and also upon wood.

Tests for Presence of Free Chlorine.

Only about 30 per cent. of the plants under consideration make any tests whatever for the presence of free chlorine. About three-quarters of those use one or another of the methods involving iodine and starch, and the balance use orthotolidine.

Strength of Hypochlorite.

Evidence has been found in the past of occasional large variations in the strength of commercial hypochlorite. In answer to an inquiry on this point only 29 per cent. indicated that the strength of hypochlorite as purchased had been determined. That this is a

point of considerable importance is indicated by the following figures. The maximum percentage of available chlorine stated was 42 per cent. Numerous others ran as high as 39 or 40 per cent. The minimum stated was 15 per cent., with several others less than 20 per cent. The average strength was 33 per cent. In two cases the maximum percentage strength noted is as large as two and one-half times the minimum strength. These variations in quality in the commercial hypochlorite are significant, and it is obvious that the strength should be determined and a correction made in the application, if necessary, if the best results are to be secured.

Deterioration in Strength of Solution on Standing.

An inquiry was included to get a line on the matter of deterioration of solutions of hypochlorite on standing. Negative answers were received in many cases, and in others no answers whatever to this question. There is no way of knowing whether the negative answers represent actual tests for the determination of this point or simply absence of knowledge in regard to the matter.

About 25 per cent. of the answers included statements which indicated that there is actual deterioration in the strength of solution. The statements are not specific, nor entirely consistent. The general experience, however, seems to show that there is substantially no deterioration in a reasonably short period. There are no statements that afford definite evidence of deterioration within a twenty-four hour period.

Bacterial Action.

The efficiency of disinfection treatments in general is well shown by the data secured on bacteria counts after chlorination. Records of this are given in some 60 per cent. of the replies. Something more than 50 per cent. of these show an average bacterial count after treatment not exceeding 20 and some 75 per cent. or more show averages not exceeding 50. The corresponding raw waters have average bacteria counts ranging from less than 100 to more than 7,000 and averaging about, 1,200.

It is interesting to note that more than 85 per cent. of the counts given as the minimum after chlorination are less than 10.

While the data given cannot safely be used for too detailed a generalization, it may be stated that they indicate that a bacterial removal of 98 per cent. may reasonably be expected. In many cases the efficiency is greatly in excess of that.

Changes in Bacterial Content Sometime after Treatment.

Certain of the inquiries were aimed to bring out information bearing upon the moot question as to the fate of bacteria after disinfection treatment especially by hypochlorite of lime. It has frequently been pointed out that, while the bacterial counts shortly after the treatment show a high efficiency of removal, some time afterward they may increase to large numbers, reach-

ing or even exceeding the raw water counts.

At least two different views have been advanced upon this point. According to one, certain kinds of bacteria, especially the spore-formers, may resist the action of the disinfectant, and later develop rapidly. According to another, there may be a toxic effect which results in a retarded development of the bacteria of many varieties on the plates within the usual period of incubation, with a subsequent development after the toxic effect wears off. The views are not widely different, excepting as to the varieties of bacteria thus affected. It is reasonable to suppose that spore-formers would have high resistance, but there may be other types too, that resist, especially with moderate doses.

In the answers to the question upon this point, about one-half those who answered stated that no difference in bacterial count was found immediately after the treatment and at remote points. Many others did not reply to the question. These may either mean that the difference was looked for and not found, or that it was not looked for at all. The other half stated that the count increased after treatment. This is stated in various ways, but the answers seem to indicate clearly the main fact as stated. In only three cases was it stated that the counts were less at remote points than they were immediately following the treatment. None of the replies gave any evidence as to the varieties of bacteria, which would give light upon the different views stated above.

It is not clear without further study just what sanitary significance this point has. The thing that is most needed in respect to this whole question is further investigation on the part of laboratories that have the particular facilities therefor.

With the data in hand as a basis, it will be possible to follow up a number of lines herein suggested, upon which further information is desired. This may properly occupy some of the efforts of the committee for the coming year.

Francis F. Longley,
Chairman.
J. L. Ludlow.
Morris Knowles.
Geo. G. Earl.
Charles Gilman Hyde.

Owing to the widely separated location of its members and the exigencies of business, the committee did not have this report ready in its present form at the time of the Convention in Jacksonville. Correspondence among the members of the committee before and since that time indicates the advisability of a further brief statement.

It is the sense of the committee that the evidence thus far secured does not disprove the need of competent technical supervision in the application of disinfection. On the other hand, in view of the uncertainties still attached to the process, such supervision is of the highest importance, in order to avoid tastes and odors due to overdosing on the one hand, and, on the other, the dangers lying in the combination of possible underdosing and fancied security in the efficiency of the treatment.

It is further the sense of the committee that the following questions are pertinent and important and merit the attention of the committee in its further work:

Intermittent vs. Continuous Treatment.

Is it advisable to apply disinfection continuously in conjunction with filter plants, thus affording the filter operator a means of operating his filter with less regard for high efficiency and more dependence upon disinfection for assuring the good bacterial conditions finally desired? Or, on the other hand, is it advisable to recognize that inefficient operation is more likely to occur at times of exceptional demand than at other times, and that under normal operating conditions, disinfection is an additional safeguard of such value that it should not be given up merely for the chance of securing more careful operation?

Economy in Coagulant.

Are there any merits in the claims sometimes made of economy in the use of coagulants with disinfecting processes used in conjunction with filtration?

Form of Application.

What is the relative desirability of applying hypochlorite as a clear solution, a milky suspension, or a powdered solid?

Application Under Pressure.

What means have been most successfully used for applying disinfectant solutions to pipes under pressure?

There are also other questions of some importance, upon which the committee has sought information, with but little success thus far.

Francis F. Longley,
Chairman

PROGRESS REPORT OF THE COMMITTEE ON SEWERAGE AND SEWAGE DISPOSAL.

SANITARY ENGINEERING SECTION, AMERICAN PUBLIC HEALTH ASSOCIATION.

Read before the Section on Sanitary Engineering, American Public Health Association, Jacksonville, Fla., November 30–December 4, 1914.

Introduction.

THE Committee on Sewerage and Sewage Disposal, after debating the advisability of investigation and report on some of the more technical phases of sewage disposal, such as minimum allowance of dissolved oxygen in water-courses, concluded that for this year at least greater benefit to the Association as a whole would result from enlargement upon some of the essentials contained in last year's report by a discussion of "The Fundamental Considerations in the Design and Maintenance of Sewage Treatment Works which should be Understood by Officials and the Public in Towns about to Install such Works and the Adoption of Methods for the Avoidance of Objectionable Odors."

Design.

Very few towns voluntarily take up for consideration the installation of sewage treatment works, for it seldom occurs that the discharge of municipal sewage into a water-course menaces the health of the people living in that community to an extent that they, on their own initiative, assume the considerable outlay of money needed for sewage treatment. Works of this kind are not revenue-producing, but must be recognized as undertakings involving, for success, constant care and supervision and necessarily liberal expenditure. Usually such outlay of funds is made to obviate damages caused by the pollution of the water-courses or on order issued either by the courts or some constituted state authority. Hence, it is important that officials and the public in towns about to install sewage treatment works should know how to proceed in order to secure the proper kind of works.

No one method or no particular combination of processes is best for adoption in every case. The best treatment is that which, including first cost and cost of maintenance, will most economically produce an effluent suitable for discharge into the local water-courses.

The use to which the stream is put and the available water for dilution should be factors in the design of every plant, and treatment should not be carried further than is made necessary by the conditions of the stream which is to receive the sewage after treatment.

Where streams are used as sources of water supply for near-by towns a higher standard of effluent is required than where the purpose of the treatment works is only to prevent nuisance.

The composition and condition of the crude sewage partly determines the kind of treatment necessary to obtain the required effluent.

Local conditions, such as the kind of sewer system already in use or contemplated, topography of the town, the availability of different construction materials, number and character of population, the presence or absence of industries whose wastes may have to be considered, the probable future development of the town, and finally the financial ability of the community, are all controlling factors in the design of the works.

A good design is important and much first cost can be saved by an experienced engineer in adapting the design to the local conditions, but intelligent supervision after the plant is put in operation is still more important.

A plant designed for partial treatment properly operated is better than a more highly developed plant which is neglected, or operated without regard to the essential theory on which the design was based.

The time has passed when the desirability of any treatment should be predicated on the fact that little or no attendance is required. Rather, all disposal works should be recognized as machines which require intelligent supervision and which, if properly designed and maintained, can be made to produce just that quality of effluent which the diluting capacity of the local stream will render satisfactory. In this way greater general progress in the betterment of stream conditions will result.

It will frequently happen that, in small streams, the dry weather flow can, with profit, be increased by the intelligent use of stored upstream water and the discharge of a partly treated sewage thus made possible at all seasons.

In designing a plant for any community it should be made of adequate capacity, not only for the present but to meet the needs for some years to come, in order to prevent surprise at the increased load and the consequent overload in a few years. Where the growth of a town is very rapid, it may be possible that the increase of population and the infiltration of ground-water may tax the sewerage system and sewage disposal plant to its full capacity by the time the works are completed, thus resulting in a plant which does not meet popular expectation.

On the other hand, where the two-story type of tank is adopted, care must be exercised that the tanks are not made too large, as under such circumstances they are liable to fail of their purpose by reason of the sewage in the settling chamber becoming septicized and creating nuisance.

To overcome these conditions a comprehensive plan for the works should be adopted which will provide for a sufficient number of units

to be added as the necessity develops and as the art of sewage disposal advances.

Town authorities should not deal with the proprietors of any patented processes or devices for sewage treatment without the assistance of some competent advising engineer. The treatment of sewage has always seemed to be a particularly fertile ground for the exploitation of patented methods; from the early days of the many processes of chemical precipitation, to the present-day electrolytic treatment, and many of these, while apparently successful in the experimental plants, are entirely infeasible on a practical scale. There is danger in deducing results from small test apparatus without scientific study by a qualified expert. Often the cost of such treatment, when undertaken practically, is prohibitive. The proprietor of a process who is looking for a contract will give a bond and make various propositions which appeal to the people of a town and is likely to lead them to favor the acceptance of such propositions. Many costly mistakes have been foisted on communities in this way.

The problem of sewage disposal is not one to which a readymade solution is applicable, but each case should be studied, so that its peculiar needs may be met in the most efficient manner and with the most economical expenditure of funds.

In many of the thickly populated states, the location of the treatment works, the type of works, and the details thereof must be approved by some state commission or department of health. Where possible it is desirable that there shall be preliminary visits to the proposed sites by the agents of the state and town. This will obviate the preparation of plans for two or more sites. Usually such preliminary conferences will also result in an agreement as to the general type of plant required. Where there is no state supervision the town authorities must depend upon the advice of the expert they employ.

One of the most important matters to be considered and one which greatly concerns a community is the location of the treatment works. As a general proposition it is advisable to select a site remote from habitation and public highways, for while it is possible, with properly designed and constructed sewers and treatment works, to maintain by careful operation inoffensive conditions, it must be recognized that by the very character of its work a sewage treatment works can never hope to compete, in point of odor, with a peach orchard in bloom.

Processes.

The available processes for sewage treatment may, for convenience, be divided into three groups:

(a) Clarification or the removal of suspended matter by means of fine screens or sedimentation tanks.

(b) Oxidation or the conversion of the decomposable matters into more stable forms by means of biological forces in intermittent sand filters, contact beds or percolating filters.

(c) Disinfection or the destruction of bacteria usually by means of hypochlorite of calcium.

The many different devices under each heading may allow of a large number of combinations and the selection made should be based on the economical phase of the problem.

Certain processes are very efficient when under the watchful care of scientifically trained operators provided with a laboratory, which would be unwise to adopt for a community whose finances will not allow of such annual expense. In such cases higher first cost of installation may prove to be more economical in the end.

Usually the first process of treatment is the removal of the solid matters which have been maintained in suspension by the velocity of flow in the sewer. In the past, when the solids were allowed to settle in tanks in which the sewage flowed over and in contact with the putrescent deposits in the bottom, odors resulted. Also, when the deposit from such tanks, called sludge, was placed upon the ground or upon drying beds the foul emanations added to the nuisance, but within recent years two-story tanks have been devised and are in successful operation whereby the sewage is settled for a short period of time in the upper story and the sludge allowed to remain in the lower compartment of the tank sufficiently long for the decomposable matters to digest, and the settling sewage is kept from coming in direct contact with the digesting sludge. Such tanks will discharge an effluent practically free of settleable matter in nearly as fresh a condition as when received. The gases evolved during digestion of the sludge away from contact with the sewage are principally methane or marsh gas and carbon-dioxide, both of which are inodorous. Sludge withdrawn from such tanks after digestion is inoffensive, dries quickly and may be used for filling low land or for agricultural purposes with no danger of nuisance.

If the conditions require more refined treatment than sedimentation it becomes necessary to adopt processes for oxidation. This may be accomplished by means of intermittent sand filters, contact beds or sprinkling filters, the choice of which is largely dependent on the availability of different construction materials and the size of plant to be installed. Intermittent sand filters are only economical where large areas of sandy soil are available. The cost of procuring sand and fine gravel and transporting it for a distance makes this type of filter prohibitive in other sections, except for small installations. The sprinkling filter, on the score of economy, and on account of the maximum efficiency secured on a minimum area of land, is generally given preference; yet under certain conditions contact beds are justified.

The present-day tendency is to adopt processes which will maintain as

far as possible aërobic conditions in the liquid at all stages through the plant; the maintenance of such aërobic conditions is the primary consideration in avoiding nuisance.

As the purpose of disinfection is the destruction of pathogenic bacteria, in order to provide a double safeguard against water-borne diseases it can be generally said that disinfection of sewage is an unnecessary refinement, unless the effluent of the sewage treatment works is discharged into a water course adjacent to and above the intake of a water purification plant, and even in such a case the responsibility of protecting the public health should rest upon the purification of the water.

It is not practical to disinfect crude sewage containing particles of organic matter of appreciable size as with the usual period of contact it is impossible for the disinfectant to penetrate the solids.

Odors.

The amount of odors depends largely on the freshness of the sewage and the method of treating and handling the sludge. The freshness of the sewage depends largely on time of travel and the design of the collecting system, on the adaptation of size to discharge, the provision for self-cleansing velocities and on the ventilation of the sewers so as to provide as much natural aëration to the liquid as possible. If the sewage is fresh or if, in other words, it contains dissolved oxygen there will not be serious odors from the application or treatment of the liquid portion, provided the plant is maintained with no lodgment of sewage in pools or overloading of the surface of the filters.

In the sludge there is a potential cause of odors, but by the use of the more modern type of tanks, with thorough digestion of the decomposing solids and discharge on properly prepared sludge drying beds, under favorable weather conditions, no odor of serious moment, noticeable more than a few hundred feet, should ever occur. Odors can be largely eliminated by good design, but their occurrence depends more particularly on proper supervision of the plant.

By the use of the two-story sedimentation tanks, which provide for the digestion of sludge, and by care in the management of the works, plants are operated in Europe and in this country where no odors are noticeable either from the sewage or from the sludge during drying.

In plants where other methods of treatment are adopted, it is probable that odor will be produced. It has been estimated that at such a plant capable of treating the sewage of 50,000 people, with good management, no odors should ever be apparent beyond 1,000 to 1,200 feet from the works, even when sludge is being discharged upon the drying beds or in the spring when the filters are in bad condition due to the past winter interfering with work being done on them.

With smaller plants this distance should be less and with larger plants possibly more. By diffusion, of course, the odor becomes more faint as the above-named distances are reached, and beyond these distances no odor should be noticeable. What might be termed odors strong enough to be disturbingly disagreeable to a person whose nasal sensitiveness is not affected by his knowledge of the source of the odor should perhaps never be found at a distance more than one third of those mentioned. It should, however, be noted that an odor from a sewage plant which if from a farm would never be noticed or which would be accepted as simply natural and reasonable will generally develop complaints of nuisance. Sentiment regardless of facts frequently blames on an inoffensive sewage disposal plant bad odors from other sources. In short, sewage treatment works should be as isolated as it is economically possible.

For the avoidance of odors, the fundamental considerations are the delivery of the sewage as fresh as possible at the plant, the application of the liquid portion to the filters before the sewage has become stale, and the proper treatment of the sludge so as to render it comparatively odorless and easily handled.

Disposal plants should be made attractive by planting and parking, and no money can be better spent than this. The trees to some degree prevent the spreading of the odors, and in the planting of trees and shrubs the direction of the prevailing wind should be taken into account.

Local authorities when they first take up for consideration sewage treatment frequently look upon the plant as a dump for municipal waste and it never occurs to them that it is good policy to spend money to make the works so attractive that people will voluntarily make it the objective point of their Sunday afternoon strolls.

Such beautification and the proper maintenance of the appearance of the plant is the surest and best means of preventing complaints of odors or nuisance, this because of the psychological effect on those living near the plant and also on the attendants who unconsciously adopt a higher standard of cleanliness and care of the works.

To sum up the whole subject of odors at sewage works: Their prevention depends upon the maintenance of aërobic conditions; by cleanliness in the sewers and about the works and by the separation and thorough digestion of the sludge resulting from tank treatment.

And these conditions can only be obtained by skilled operation of both the sewer system and the treatment works.

Frank A. Barbour,
George A. Johnson,
Langdon Pearse,
F. Herbert Snow,
George S. Webster, *Chairman.*

REPORT OF THE COMMITTEE ON REFUSE COLLECTION AND DISPOSAL.

SANITARY ENGINEERING SECTION, AMERICAN PUBLIC HEALTH ASSOCIATION.

Read before the Section on Sanitary Engineering, American Public Health Association, Jacksonville, Fla., November 30–December 4, 1914.

DURING the past year the attention of this committee has been directed again toward a Standard Form for Statistics of Municipal Refuse. At the 1913 convention, the Committee presented a tabulation of statistics from cities made up on a trial standard form for such statistics. These data formed a useful contribution to the subject. This preliminary form, however, was in the opinion of the Committee too comprehensive for general use. The Committee has, therefore, been formulating a simplified "Form." The final arrangement of the form has not yet been completed, although a suggested arrangement has been prepared by Col. Wm. F. Morse.

For the coming year the Committee intends to continue work along this line and to give an extended trial to the shorter, simpler forms. It is a pleasure to record that a committee of the American Society for Municipal Improvements are also working toward the development of a standard form, and it is our hope to coöperate in this activity.

The committee wishes to call the attention of members of the association to comprehensive investigations for improved refuse disposal which have been made at Chicago, Ill., Dayton, Ohio, Toronto, Canada, Detroit, Mich., St. Paul, Minn., Albany, N. Y. and New Orleans, La. The results of the investigations can be secured from the local authorities. Of particular interest is the trial, on a large scale in New York City, of the tractor-trailer method of refuse collection.

New plants for refuse incineration have been put into operation at Savannah, and Atlanta, Ga., and for the reduction of garbage at Schenectady, N. Y. and Los Angeles, Calif. A large number of smaller towns have undertaken the construction of garbage plants without careful preliminary investigation, or the publication of adequate specifications. This practice is not recommended by the Committee, because it too often results in poorly built plants, and in plants, the operation of which, if satisfactory, is generally more expensive than that of better and somewhat more expensive plants; similar to the difference in the cost of pumping water whether simple or triple expansion engines are used.

The Chairman of the Committee has received many inquiries for general information on refuse collection and disposal, particularly from woman's

civic organizations. A tabulation of data compiled from the Standard Form for Statistics would be of real service to such civic organizations.

It is the opinion of the Committee that problems of refuse collection and disposal should be worked out more than formerly along engineering lines, and that this feature has not been sufficiently appreciated by public officials. Members of the American Public Health Association should use their influence to counteract this tendency.

SAMUEL A. GREELEY, *Chairman.*
RUDOLPH HERING,
WM. F. MORSE,
X. H. GOODNOUGH,
JOHN H. GREGORY.
Committee on Refuse Collection and Disposal.

PROGRESS REPORT OF COMMITTEE ON SEWAGE WORKS OPERATION AND ANALYTICAL METHODS.

TO THE

SANITARY ENGINEERING SECTION OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

Read before the Section on Sanitary Engineering, American Public Health Association, Jacksonville, Fla., November 30–December 4, 1914.

PART I.—ON SEWAGE WORKS OPERATION.

INTRODUCTION.

The introduction of sewer systems into modern cities whereby the wastes of domestic life and industry are discharged into water courses has brought about the need for the treatment of sewage in order to accomplish two purposes:

(a) To promote the comfort and convenience of the people by maintaining water courses in a decently clean condition, that is, free from nuisance to sight or smell so as to be fit for civic development, industry and recreation.

(b) To aid in protecting the public health, when necessary, by maintaining watercourses as fit sources of water supply after adequate purification or for the cultivation of shell fish.

The initiative for installation of sewage treatment works usually is either

(a) The recognition by a community of the fact that nuisances in water courses retard municipal developments, deprive the citizens of their use of the streams and offend common decency.

(b) An order from a properly empowered body for the installation as a sanitary measure for the protection of the users of the watercourses.

The design and extent of the works and the degree of treatment required should be such as to promote economy of funds in order to give the greatest benefit to the largest number of people at the least cost.

Based upon these premises, the operation of a sewage treatment works may be judged by the following standards:

(a) Prevention of nuisance either at the works or in the body of water receiving the effluent.

(b) Protection to the public health, *e. g.*, in reducing the pollution in a water course to relieve the load on a water purification plant.

In the following discussion it is assumed that under the guidance of competent sanitary engineers the specific problem has been studied, resulting in the design and construction of efficient sewage treatment works and

TESTS FOR DETERMINING THE COMPOSITION OF CRUDE SEWAGE FOR COMPARISON

OCCASIONAL COMPOSITE SAMPLES TO BE ANALYZED FOR NITROGEN AS ORGANIC AND AS FREE AMMONIA
TEST FOR SUSPENDED MATTER CALLED Y IN REPORT
AND CHLORINE
AT SAME TIME SAMPLES TO BE EXAMINED FOR AVIDITY FOR OXYGEN TEST CALLED X IN REPORT

FOR SEWAGE TREATMENT WORKS PRIMARILY DESIGNED TO PREVENT NUISANCE

TYPE OF WORKS	TESTS FOR OPERATING CONTROL AND DETERMINATION OF EFFICIENCY					TESTS TO DETERMINE SUFFICIENCY OF TREATMENT
	INFLUENT AND EFFLUENT OF PRELIMINARY PROCESSES	SLUDGE DRAWN FROM ONE STORY TANKS	SLUDGE DRAWN FROM TWO STORY TANKS	EFFLUENT OF OXIDATION PROCESS	FINAL EFFLUENT AS DISCHARGED INTO THE RECEIVING BODY OF WATER	RECEIVING BODY OF WATER
WORKS CONSISTING OF PRELIMINARY PROCESSES ONLY SUCH AS FINE SCREENS OR SEDIMENTATION	① TEST FOR THE AVIDITY FOR OXYGEN CALLED X IN TEXT ② TEST FOR SUSPENDED MATTER CALLED Y IN TEXT	① SPECIFIC GRAVITY ② PERCENTAGE MOISTURE IN WET SLUDGE ③ PERCENTAGE OF DRY RESIDUE THAT IS VOLATILE ④ REACTION OF WET SLUDGE			⑥ TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT. ⑦ TEST FOR SUSPENDED MATTER CALLED Y IN THE TEXT.	① DISSOLVED OXYGEN. ② TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT.
WORKS CONSISTING OF PRELIMINARY AND OXIDATION PROCESSES SUCH AS CONTACT BEDS OR PERCOLATING FILTERS				① NITROGEN AS NITRATES. ② TEST FOR THE AVIDITY FOR OXYGEN CALLED X IN TEXT ③ DISSOLVED OXYGEN ④ RELATIVE STABILITY *	① TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT. ② NITROGEN AS NITRATES. ③ DISSOLVED OXYGEN. ④ TEST FOR SUSPENDED MATTER CALLED Y IN TEXT. ⑤ RELATIVE STABILITY *	

* IN SMALL PLANTS NOT PROVIDED WITH A LABORATORY RELATIVE STABILITY MAY TAKE FIRST PLACE.

FOR SEWAGE TREATMENT WORKS PRIMARILY DESIGNED TO PROTECT SOURCES OF WATER SUPPLY

TYPE OF WORKS	TESTS FOR OPERATING CONTROL AND DETERMINATION OF EFFICIENCY					TESTS TO DETERMINE SUFFICIENCY OF TREATMENT
	INFLUENT AND EFFLUENT OF PRELIMINARY PROCESSES	SLUDGE DRAWN FROM ONE STORY TANKS	SLUDGE DRAWN FROM TWO STORY TANKS	EFFLUENT OF OXIDATION PROCESS	FINAL DISINFECTED EFFLUENT AS DISCHARGED INTO THE RECEIVING BODY OF WATER	RECEIVING BODY OF WATER
WORKS CONSISTING OF PRELIMINARY PROCESSES AND DISINFECTION	① TEST FOR THE AVIDITY FOR OXYGEN CALLED X IN TEXT ② TEST FOR SUSPENDED MATTER CALLED Y IN TEXT.	① SPECIFIC GRAVITY ② PERCENTAGE MOISTURE IN WET SLUDGE ③ PERCENTAGE OF DRY RESIDUE THAT IS VOLATILE ④ REACTION OF WET SLUDGE			① PRESUMPTIVE TEST FOR B. COLI. ② TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT. ③ TEST FOR SUSPENDED MATTER CALLED Y IN TEXT.	① PRESUMPTIVE TEST FOR B. COLI. ② DISSOLVED OXYGEN. ③ TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT
WORKS CONSISTING OF PRELIMINARY AND OXIDATION PROCESSES AND DISINFECTION				① NITROGEN AS NITRATES. ② TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT. ③ DISSOLVED OXYGEN. ④ RELATIVE STABILITY.*	① PRESUMPTIVE TEST FOR B. COLI. ② TEST FOR AVIDITY FOR OXYGEN CALLED X IN TEXT. ③ NITROGEN AS NITRATES. ④ TEST FOR SUSPENDED MATTER CALLED Y IN TEXT. ⑤ RELATIVE STABILITY. * ⑥ DISSOLVED OXYGEN.	

WITH REPORT OF COMMITTEE ON SEWAGE WORKS OPERATION AND ANALYTIC METHODS. A-P-H-A - NOVEMBER 1914.

upon the completion the owner is confronted with the problem of its operation and maintenance.

One of the first and most important matters to be considered in the operation of a sewage treatment works is the heterogeneous nature of sewage. Its composition varies widely in different towns, influenced by the ways of living and amount and kind of industrial wastes. Some works receive a sewage so fresh that original fæcal matter, paper and fats are practically unchanged, while in others the solids have disintegrated and partly dissolved.

The hourly character and composition of the sewage may also vary from day to day, being uniform in one place and different in another. During storms the sewage collected by a combined system of sewers is increased in volume and its composition changed to a very marked degree.

Many of the forces of nature are utilized in sewage treatment in an involved and complex manner. Gravitation is utilized in sedimentation and in the hydraulics of the flowing liquids; chemical reactions occur in the use of precipitants, in disinfection and in the changing combinations of sewage materials; and biological forces are active in the digestion of sludge and in the oxidation of the dissolved organic matter.

In successful operation all of these factors must be controlled. It is, therefore, self-evident that sewage treatment works, particularly of any size, cannot be made automatic, but require constant observation and supervision by trained, skilled operators in order to accomplish the purpose for which the plant was installed and the funds invested.

SUPERVISION.

The degree of technical skill required depends upon the following factors, but not necessarily in the order given:

(a) The magnitude and design of the works.
(b) The processes used.
(c) The composition of the sewage treated.
(d) The receiving body of water.

It does not always follow that because a sewage treatment works receives a large volume of sewage that the responsibility is in proportion to the magnitude, because the processes used may be simple and the dilution of the effluent large. Some small works, for particular purposes, *e. g.*, fat recovery, may require very expert supervision.

The use of biological works for oxidation or the use of disinfection always requires more attention than simple sedimentation. Emscher tanks which include sedimentation and sludge digestion in a single device require a higher degree of skill to operate than plain sedimentation tanks. The presence of considerable volumes of trade wastes in sewage usually introduces difficulties not encountered with ordinary domestic sewage.

Constant attendance upon a sewage plant for a private estate or small institution is unnecessary. Such plants should be simply designed, so that an employee with other duties is required to give but a small part of his time to the care of the plant. But in such cases successful results are not always obtained unless the designing engineer or some competent person is called in at regular times to inspect and advise concerning the technical details of operation. Such inspections are particularly important during the early life of the plant to train the attendant to observe and interpret the conditions which require attention.

For the larger institutional plants and works for small towns more skilled attendants are required and the need for competent supervision more urgent.

In municipal sewage treatment works of any magnitude the constant services of a scientifically trained man in charge is practically essential to success. The larger volumes of sewage treated afford greater potentialities for the creation of nuisance from bad odors if the works are not constantly kept in the best condition. The effect upon the receiving body of water is also greater and a deterioration in the quality of the final effluent may allow the development of conditions such as nuisance in the water course or danger to water supplies which it is the very function of the works to prevent. And finally it is economical to pay a liberal salary to the right kind of man to keep the annual charges for operation and maintenance at a minimum figure by business-like management.

RECORDS.

The keeping of careful, thorough and neat records of operation is essential to efficient operation. State authorities charged with supervision over the condition of the water courses should require a uniform record. Such records from the operating point of view show the effect of changing methods of operation and enable the selection of the most efficient and economical procedure. Complaints of citizens can frequently be answered and explained away by reference to the records, and often well-kept records have prevented suits or lessened damages.

As an example of the value of records, two different hypothetical cases may be cited: A sewage treatment works required to prevent the creation of nuisance in a stream not used nearby as a source of water supply. Here records of the stage and conditions of the stream and condition of the final effluent may show that less than complete treatment would be sufficient during a portion of the year and the saving in labor of operation materially reduce annual operating charges and still the plant would efficiently perform the function for which it was installed.

On the other hand a plant whose purpose is primarily intended to protect the nearby source of water supply requires most careful records, so that in case of the failure of the water purification plant to produce a wholesome water the responsibility cannot be placed upon the sewage treatment works.

Records to be really valuable should not be cumbered with useless data. The essentials should be carefully determined and made graphic wherever possible.

NEATNESS.

Too much stress cannot be laid upon the importance of neatness and cleanliness in and around the works and the surrounding grounds. To accomplish its purpose this cleanliness must begin in the sewer system, for accumulation of decomposing matters therein will surely hasten decomposition to such a degree that at times no amount of care at the works can prevent the dissemination of bad odors. The cleanliness begun in the sewers should be carried out through the plant and no filth should be allowed to accumulate, but it should be promptly disposed of.

But small expense is involved in laying out flower beds or shrubbery especially at the entrance and to serve as a screen around unsightly parts of the works. A moderate amount of attention to these details removes the inherent prejudice in the mind of the visitor or passerby.

DETAILS.

The above sets forth only the broad principles underlying successful operation; for the details of operation attention is called to a series of articles entitled, "The Operation of Sewage Disposal Plants" published at monthly intervals during the current year in the *Municipal Journal*.

Part II.—On Analytical Methods.

INTRODUCTION.

The latest edition of "Standard Methods of Water Analysis" of the American Public Health Association supplies sanitary engineers, chemists and bacteriologists with a nearly complete set of analytical procedures, many of which are of assistance to sewage works operators; they do not, however, state which of the many tests described are most useful for the practical purpose of sewage works operation.

Certain tests are, therefore, submitted herewith and their use and relative value commented upon. The following outline of recommended tests has been prepared in the light of modern sewage investigations rather than by following established practice in water analysis; it is the result of careful thought, based on experience in the actual operation of sewage treatment works.

Different works obviously require the use of different sets of tests for their study and control, based upon peculiar needs and conditions and, therefore, no definite set of tests can be laid down to suit all conditions. For example, a plant for preliminary treatment only, such as fine screening or sedimentation, might well be operated without any consideration of the amount of nitrate present in the sewage at any stage; but in the operation of bacterial processes, such as sprinkling filters, the formation of nitrate is of prime importance to indicate the efficiency of the filter.

Hence, the outline of tests submitted is to be considered as broadly suggestive and not as a specification for every conceivable condition.

Laboratory facilities are frequently limited and help lacking, so that it is impossible to carry on extensive investigations. The tests recommended are, therefore, limited to the most important and useful, realizing that where opportunity exists other work will be carried on, as in the case of testing stations.

COLLECTION OF SAMPLES.

Due to its heterogeneous nature, the composition of crude sewage is very variable and chance samples taken at short intervals of time will, upon analysis, yield very different results; but when the sewage is submitted to increasing refinements of treatment, this variability in composition is lessened. It is, therefore, advisable for all tests in which the samples can be properly kept for a time before analysis, to obtain a composite sample made up of a number of small portions and thus automatically obtain an average sample for analysis. To do this properly, the size of the individual portions should be proportional to the rate of flow of sewage at the time of sampling, but it is recognized that with the class of labor usually available at sewage treatment works, this ideal cannot be realized. The frequency of sampling will largely depend upon the available force at the plant. Crude sewage should be sampled at more frequent intervals than effluents of refined processes of treatment.

It is of great importance for the proper interpretation of published data, that in connection with reported analyses a statement be made of the frequency of sampling and whether the figures given are, for instance, the average of certain chance samples or the averages of continuous composite sampling.

COMMENTS ON TESTS RECOMMENDED.

Test X.—By this designation is meant a test for measuring by incubation the avidity of the sample of sewage or effluent for dissolved oxygen or its equivalent. The Royal Commission on Sewage Disposal developed a technique for such a test (see Sect. 2, Vol. 11, Appendix, 8th Report 1913 or *Engineering Record*, October 25, 1913, page 453). Another method was developed by Mr. C. B. Hoover and is in use at the sewage treatment works at Columbus, Ohio (see *Engineering News*, May 28, 1914, page 1187) and still another has been devised by Dr. Arthur Lederer and is in use in the laboratories of the Sanitary District of Chicago (see *Journal Infectious Diseases*, May, 1914, and paper to be presented by him to the Laboratory Section A. P. H. A. at these meetings). At present, a Committee of the Laboratory Section is about to propose a provisional procedure for such a test.

This test is considered to be of prime importance; but as there is, as yet, no definitely recognized technique nor name it is here indefinitely designated by the symbol X.

For the present it is *urgently* recommended that some form of the test be used even though all workers may not agree on the exact procedure to adopt.

Test Y.—By this designation is meant a test for measuring not only the amount but also the condition and physical characteristics of the suspended matter in sewage.

Suspended matter was first determined by the difference in the weight of the residue upon evaporation of a portion of the sample filtered through paper and another unfiltered. At the present time, the Gooch Crucible is generally used to obtain the weight direct. In both procedures the organic portion of the suspended matter was estimated by determining the loss of weight upon ignition. The Royal Commission on Sewage Disposal attempted to devise a method for determining the amount of suspended matter by means of the centrifuge. In the works of the Emschergenossenschaft a simple field method is in use for determining the bulk of the settleable matter by subsidence in graduated conical glasses.

None of these methods, however, furnish information concerning the size, physical condition or other characteristics so essential to know in the preliminary treatment of sewage. One of the reasons for this is the small size of the sample examined and the difficulties of obtaining a representative portion for analysis; for the inclusion or exclusion of a large-sized piece of suspended matter in a small-sized sample will cause large variation in the result obtained.

The efficiency of all preliminary processes depends upon the removal of the settleable solids and, therefore, a test to measure them is of great importance.

It is, therefore, recommended that in sewage works operation some procedure for the determination of suspended matter be used and that analysts be urged to devise a technique to supply the information required.

Nitrates.—This test is very useful because its place in the interpretation of analyses is well understood and it is a delicate indicator of the activity and efficiency of oxidation processes. Moreover, the results are available within a comparatively short time after the samples are taken.

Dissolved Oxygen.—This test is of great value because of the light it throws on the condition of the receiving body of water. Its use is recommended also in connection with effluents from oxidation processes.

The amount of dissolved oxygen present in a stream at any particular place or time, or in an effluent, should, however, be considered in connection with either the results of the test designated X or relative stability, for the presence in the sample of sufficient decomposable matter might exhaust in a short time the dissolved oxygen found by the analysis.

Relative Stability—Methylene Blue.—This test has a definite value in connection with the dissolved oxygen and nitrate tests in explaining the records of past operation, but its greatest value is as a control for small works. Obviously, many small works cannot be kept under the continual observation of a trained chemist or engineer and in such cases the relative stability test can be readily made by an attendant incapable of the more elaborate procedures. Under these conditions relative stability is of primary importance and its daily use is strongly recommended in preference to occasional tests of other kinds.

Caution should be used in regard to the relative stability of tank effluents, sterile effluents or effluents containing certain industrial wastes.

Tests of Sludge.—

(a) Specific gravity.
(b) Percentage moisture.
(c) Percentage of the dry residue that is volatile.
(d) Reaction—Alkalinity or acidity.

These tests made on sludge especially from two-story tanks and separate sludge digestion tanks are of great value in operation, as they interpret the biological digestion of the organic matter. The reaction test is particularly important as an aid in detecting the cause and pointing out the remedy for poor sludge production. It has been found that tanks producing bad sludge can be made to produce good sludge by adjusting the reaction from acid to alkaline.

In sludge obtained from fine screening it is advisable to determine the weight per unit volume and percentage moisture.

Bacteria—Presumptive tests for B. Coli.—For sewage treatment works intended solely to prevent nuisance in water courses, tests for bacteria are superfluous.

They are, however, of the utmost importance in cases where the works are intended to protect sources of water supplies or shellfish layings.

It is unnecessary to carry on the confirmatory tests for B. Coli used in water works control, as the presumptive tests are much simpler and more conservative.

The formation of gas or the red colonies having appearance of B. Coli on Litmus lactose agar at 37° are both in successful use for this purpose.

When used, the test should primarily be made on the receiving body of water and secondarily on the effluents from disinfection processes.

TESTS OF CRUDE SEWAGE FOR COMPARISON.

For the purpose of record and comparison it is advisable to make at intervals tests upon composite samples of the crude sewage received at the works. These tests should indicate the character, condition and strength of the sewage.

It is recommended that at least the following determinations be made:

(1) Test for suspended matter called Y above,

(2) Test for avidity for oxygen called X above,

(3) Nitrogen as organic,

(4) Nitrogen as free ammonia,

(5) Chlorine.

Special cases may require other tests to show the characteristics of the sewage.

Particular attention is called to the notes on Test X, dissolved oxygen and bacteria in connection with the receiving body of water. Tests when applied to sewage and effluents are of value as tools for operating control, but as a measure of sufficiency of treatment they do not always supply adequate information. This is on account of the difficulty of formulating precise standards for effluents discharged into different kinds of receiving bodies of water, and, therefore, the final criterion of sufficiency of treatment must logically rest in the effects produced upon the receiving body of water considered in the light of expediency and local needs. Investigations of the effects of effluents on bodies of water are, therefore, urgently recommended.

For the different purposes of operating control, determination of efficiency and determining sufficiency of treatment, the tests commented upon above are grouped in a diagrammatic table submitted herewith.

CONCLUSION.

The Committee wish to express their thanks and appreciation to Mr. F. E. Daniels for valuable services rendered in the preparation of this report.

One of the functions of this Committee is coöperation with the Laboratory Section. It is, therefore, recommended that the proper committee of that Section take up for consideration the improvement of the test for suspended matter in sewage called Y in this report and that during the coming year analysts direct their attention to the simplification and standardization of the test for avidity for oxygen called X in this report.

The Committee consider Part II as a progress report and request engineers and chemists in charge of sewage treatment works to send their views and criticisms of the outline of tests to the Chairman of the Committee (address 412 City Hall, Philadelphia, Pa.), in order that complete data may be collected and a final report submitted next year.

Respectfully submitted,

C. B. Hoover,
H. C. McRae,
Langdon Pearse,
George C. Whipple,
W. L. Stevenson, *Chairman.*

Book Review.

Overcrowding and Defective Housing in the Rural Districts. *By Dr. Harvey B. Bashore. New York, 1915, John Wiley & Sons, Inc. Price, $1.00 net. Cloth, 92 pages, 12 mo., 15 full page half-tones.*

This little volume should prove an eye-opener to many a layman, and perhaps even to some city physicians who have accepted without question the old belief, once founded upon fact, that country life is more wholesome than city life. That country life can and should be more wholesome than city life is not the question. Health reports show that New York City, by tremendous exertion along many lines, by raising the living standards of its people, has reduced its death-rate until it is below that of the remainder of the state. The remainder of the state, however, contains many cities, several of large size. The easy-going may jump to the conclusion that it is they which keep the state's death-rate high. Unfortunately there are among them some which do contribute more than their share toward this undesirable result; but the small towns, the villages, even the open country have small reason to complain of unfairness in being lumped with these recalcitrants in the statistics of the metropolis. Knowledge of the principles of sanitation, vigor in administering health laws and regulations have partially overcome the handicaps due to a crowded population; ignorance and slackness have largely neutralized the advantage of conditions fundamentally good.

The surprising thing in Doctor Bashore's book is the great similarity he finds between bad housing in the city and bad housing in the country. We have been so accustomed to hear excuses for bad city housing based upon the plea that land overcrowding is inevitable in great centers of population that it is to be hoped the title of Doctor Bashore's first chapter may have a wholesomely awakening effect. It is, "Land Overcrowding." In "a typical rural farming community, inhabited by native born Americans"—even the time-honored excuse of the immigrant is not available—he found the greatest and most difficult problem of urban housing.

Of course those who have studied city building know that the presence of this problem is not inevitable, that it is simply due to ignorance, lack of foresight and lack of efficient control over real estate development. But it is much easier to find an excuse after a mistake is made than it is to discover the reasons for the mistake and to take effective means to prevent its repetition. Moreover our first housing studies were made in large cities. The students have, as beginners must, supplemented their knowledge by assumptions. So it was quite natural to assume that a practice so generally condemned as land overcrowding could have been accepted only through what was thought to be necessity. Similar assumptions were made in the past by reformers who told us that New York would never have developed its barrack tenements had Manhattan Island not been surrounded by rivers which prevented the spread of population, and by reformers of the present who tell us that an adequate rapid transit system will overcome these barriers and partially at least empty the lower East Side into garden set cottages. Of course if they knew such towns as Lawrence, Mass., with its closely packed *alley* tenements on one side of its factories and open fields within a few minutes walk on the other side, they might not be so confident.

Doctor Bashore will shake their confidence still more. He describes the "row" occasionally found in Pennsylvania—and other—villages, "adjoining these narrow village streets as much land is covered relatively with buildings, as in the city."

The title of the second chapter will occasion scarcely less surprise than that of the first. It is "House and Room Overcrowding." What becomes of the tradition that it is the alien, particularly the Italian and the Pole, who is at the root of this problem in our cities, for here is a community "inhabited by native born Americans." Take one instance. "A nurse from one of the state dispensaries in her visiting work, came across a certain farm house where five people were accustomed to sleep in one not very large

bedroom, which had only one small window, and even that was nailed shut; one of these five had incipient tuberculosis. These people were well-to-do farmers living in a large twelve-room stone house, and simply crowded into one room for the sake of mistaken economy—presumably to save coal and wood."

The other three chapters are: "Defective Building," "Overcrowded and Defective Schools," and "Results." Chapters three and four probably contain no element of surprise, for even the layman of the city has spent vacations in the country and has read of the farmer who comes to town because of the better schools. Chapter five contains evidence of the results of bad rural housing, especially the high death-rate from tuberculosis, and "a very short word about the remedy for overcrowding and bad housing in the country." This work, which is not so very short, from any point of view, is "education."

Doctor Bashore's little book is a contribution of value, for it presents facts which have been too little known. These facts are of worth not only to those who are dealing with the betterment of rural conditions, but also to those whose interest is in cities. They call the attention of the former to underlying causes which must be changed before permanent advance is possible. They call the attention of the latter to the fact that conditions against which they are fighting are not peculiar to cities and so can not be altered merely by securing certain modern improvements, such as rapid transit.

John Ihlder.

A Manual for Health Officers. *By J. Scott Mac Nutt. First Edition. 660 pages. New York, John Wiley & Sons, Inc.; London, Chapman Hall, Limited, 1915. Cloth, $3.00, Net.*

It is with the sense of having at last found a long-needed counsellor that one follows the author in this most valuable addition to the literature of sanitary science. One realizes that, for the first time perhaps, a gap has been bridged, not only between the older empiricism, which clings so tenaciously to the fabric of health regulations and procedures based on more definite knowledge, but one between the application of the more scientific principles of health conservation and the means at his disposal as provided in many localities.

The chapters on the organization of health departments, their relation to the public, to unofficial organizations and to the demands of a science that has been revolutionized in a generation, are models of clear conceptions of present needs, of a proper relation of available opportunities and present a strong argument for better coöperation among existing health agencies.

A perusal of Chapter V dealing with the essential differences of the "new public health" and former conceptions would be distinctly beneficial to all members of health boards and legislative bodies. Here is a well-balanced and pleasing presentation of the possibilities in the prevention of premature mortality, standardizing, as it were, causes of death and well indicating the relative value of old and new methods, a valuable guide to communities that must carefully consider each expenditure.

Under Public Health Administration, well-tried systems of record-keeping are given, the newer theories of infection outlined and the need of careful epidemiological studies properly emphasized. In covering the various communicable diseases, due regard is paid to cases and carriers—to contact; yet only reasonable requirements are outlined, nor is the student left stranded at the ultimate ramifications of impractical theories. The bearing of control regulation on all affected by them is dealt with judiciously, for the greatest good of the whole and the expenditure of the health dollar as outlined by Mr. Mac Nutt should purchase a hundred cents' worth of health protection.

A criticism might possibly be made of the rather sweeping advice on the employment of immunizing doses of diphtheria antitoxin among exposed persons (p. 137). In view of possible anaphylaxis it might be well to govern this use of antitoxin by the application of the Schick toxin reaction for immunity or even, in view of the relatively feeble infectiousness of this disease, omit it entirely where contacts may be kept under expert supervision and symptoms be thus recognized early.

The author does not consider tetanus neonatorum, though its occurrence in certain sections of the country would indicate the advisability of official control.

The failure to mention the more recent work

of Goldberger on the dietary origin of pellagra is due probably to an oversight.

The true relation of schools to communicable disease and the important place of school medical inspection and child hygiene, in well organized health departments, is admirably outlined.

Adapted especially to the needs of the executive officer, are the chapters on milk and other foods, water supplies, housing and industrial hygiene. Sufficient information is supplied to establish their correct status in health administration without burdening the reader with details that belong more to the text-books of the laboratory worker.

A working basis of vital statistics, as well as valuable hints for better registration, are given in Chapter IX and the sane application of publicity to departmental work completes this altogether well-rounded manual.

Wherever details are omitted in the text, supplementary information is to be found in the appendices or may be sought in the abundant references given.

The health officer who has acquired some degree of proficiency through bitter experiences will recognize the advisor he has long needed and the one first entering upon the manifold and complex duties which must be assumed, if his community is to receive sound guidance in all that makes for better sanitation, will, many times, consult this volume with profit and relief engendered of its clear outlining of the best in the great modern movement of public health.

It will serve at once as an inspiration to those fitted to undertake the responsibilities of health administration and, not less important, will serve to deter any who might consider lightly the obligations attendant upon the proper execution of their duties.

It is truly a manual for health officers and as such answers clearly many of the vexatious problems that continually present themselves to the practical sanitarian.

C. E. Terry, M. D.

Personal Notes.

The following were elected to membership in the American Public Health Association on July 28, 1915:

Mrs. Wm. Lowell Putnam, Manchester, Mass.

Major James Wallace Van Dusen, Washington, D. C.

Major Robert Ernest Noble, Washington, D. C.

Mr. Adolph Lewisohn, New York City, N. Y.

Mr. Isaac N. Seligman, New York City, N. Y.

Mr. Clair Elsmere Turner, Boston, Mass.

Mr. Frank H. Mann, New York City, N. Y.

H. M. Lancaster, B. A., Sc., Toronto, Ontario.

Dr. Ralph W. Elliot, Cleveland, Ohio.

Dr. Frederick R. Green, Chicago, Ill.

Mr. Tracey W. McGregor, Detroit, Mich.

Mr. James Jenkins, Jr., Brooklyn, N. Y.

Mr. Frederick Sprenger, Bronxville, N. Y.

Miss Jennie M. Hixon, Brooklyn, N. Y.

Miss Louise Lee Schuyler, Highland Falls, N. Y.

Miss Edna L. Foley, Chicago, Ill.

Dr. Charles Albert Griffin, East Orange, N. J.

Miss Mary Louise Mark, Westerville, Ohio.

Mr. Ernest D. Easton, Newark, N. J.

*

Dr. Francis X. Mahoney, who has for some time been chairman of the Boston City Board of Health, has been appointed commissioner under a recent ordinance authorizing the reorganization of the department under a single head.

*

Dr. J. W. M. Bunker has resigned his position as Instructor in Sanitary Engineering in Harvard University and has accepted a position with the Digestive Ferments Company of Detroit.

*

Dr. W. A. Evans is foreman of the coroner's jury which is investigating Chicago's excursion steamer disaster.

Health Department Reports and Notes.

REPORTS.

Pueblo, Colorado.

The report of the health, inspection and sanitation department of Pueblo for 1914 is the first report issued by Dr. John G. Wolf, the new chief of the department. When Doctor Wolf took charge of the work he found it poorly organized and for his first task he took the systematization of the work and the introduction of an adequate system of records. A card index has been installed which includes all the various branches of work with which the department is concerned. In addition to this important step a laboratory was installed in which both diagnostic work and chemical and bacteriological analysis of milk is carried on. Regular inspection of milk, meat, and other foods was also introduced. It is planned to still further improve the work of the department by introducing civil service and competitive examinations for the employees.

Although mining and steel mills furnish employment to many of the citizens of Pueblo and there is a large foreign element in the population, the combination of the Colorado climate and the activity of the health department appear to keep conditions exceptionally good. Statistics are given comparing the death-rates in Pueblo for 1914 with the rates for the period from 1905 to 1909 and with the rates for the remainder of the United States in 1912. These show that conditions in Pueblo are improving rapidly and are better than they are in the rest of the country. The general death-rate was 12.45 as compared with 15.77 for the 1905–1909 period and with 13.9 for the registration area for 1912. Curiously enough, although the tuberculosis rate is low in a state which attracts many consumptives, its pneumonia and whooping-cough death-rates are abnormally high.

Pueblo has had a bad reputation as a typhoid city until recently when supervision of the milk and food supplies and hypochlorite treatment of the city water supply have caused the rate to fall rapidly until it is now below the average.

Considerable difficulty has been experienced in the past in the satisfactory solution of the garbage problem. Several men were accustomed to collect the garbage and feed it to hogs. They were not licensed and collected where they pleased and when they pleased so that some sections of the city were entirely neglected. Now each garbage man is required to take out a permit and to abide by certain regulations as to the collection and subsequent disposal of the garbage. He is then assigned a certain district in the city and required to collect from that district completely and regularly. Failure to abide by the agreement may lead to the withdrawal of the permit.

The report is well prepared and readable to the general public, for whom it is planned. The report of vital statistics might be made more complete for the sake of reference and comparison with other cities but a large tabulated report is of course more useless than interesting to the average reader. The financial report shows an expenditure of about thirty-seven cents per capita population for the work of the department.

Clinton, Massachusetts.

Clinton is a town with a population of less than 13,000 but its health department might well serve as a model to cities many times its size. The methods used have always been progressive and it may point with pride to having been among the first to adopt the score card system of dairy inspection, first to make use of the standard form of annual report prescribed by the Massachusetts Association of Boards of Health, and among the first to make up many other of the modern methods in public health administration.

The personnel of the department includes an agent, a clerk, a bacteriologist, a plumbing inspector, a milk inspector, a district and dispensary nurse and a food inspector. Naturally

in a town of Clinton's size it is unnecessary for these to be all full-time workers but they have apparently been unusually fortunate in their choice of employees.

The contagious disease situation was marred by an epidemic of scarlet fever in the early part of the year but aside from this it was kept in good control. An isolation hospital is maintained by the town when necessary, and a dispensary for the diagnosis of tuberculosis and for vaccination is also maintained.

Regular inspection of milk and dairies is carried on and the use of educational methods combined with the score card has brought about a considerable improvement in the supply. In the milk show at Worcester the milk supply of Clinton ranked sixth among the towns represented. Of 244 samples of milk taken from wagons by the milk inspector during 1914 and the early part of 1915 only two showed more than 70,000 bacteria per cubic centimeter.

The birth-rate in Clinton was 27.45, the death-rate 12.08 and the infant mortality rate 117 per thousand births. The expenditures of the board of health for the year amounted to about fifty-one cents per capita.

United Fruit Company Medical Department.

While it is unusual to treat private corporations in this section, a departure now and then is only a fair recognition of the fact that in some parts of the world the public health depends largely upon the activities of private business concerns.

The report of this great corporation's medical department covers 125 pages and is bound up in a booklet presenting much the same appearance as the average city health department report.

This report is composed almost entirely of statistics, except for the letters of transmittal from the various division superintendents, and is therefore a bit disappointing to one who would be interested to learn more of the conclusions reached by the sanitarians of the company as a result of their year's work under the generally adverse conditions which tropical climates produce.

It appears in the general statement that the total number of patients receiving treatment in the company's dispensaries, hospitals and steamships during the year was 127,809, and the average number of employees and others, who were dependent on the company for medical service during the year, was 71,910.

The company maintains a hospital and dispensary service in each of its divisions. These are scattered through the West Indies and the northern portion of South America. And in addition to this, it exercises a sanitary supervision over numerous villages occupied by its employees. The following statement, concerning the village and district of Changuinola in the Bocas del Toro (Panama) Division, is more or less typical:

"CHANGUINOLA.—The village and entire district is well drained and comparatively healthy, except for malaria. All offices and residences of white employees are well screened and kept in repair, laborers' quarters cleaned, well ventilated and dry. Grass and bush are cut once per month throughout the village and around all farmhouses.

"The sewerage system is complete and in repair. We have an adequate supply of pure water. The company operates an ice plant in Changuinola Junction, using distilled water. Ice is supplied to employees three times per week.

"Garbage is collected daily and carried by train to a suitable dump and burned. The district is inspected at regular intervals by a competent sanitary officer."

NOTES.

Letting the Public Know What to Do.—The "General Information" below is from Vol. 1, No. 1, *Monthly Bulletin of the Department of Health of Dallas, Texas.*

This information is extremely important; every householder and housewife should know every one of these items and every individual adult in the city should know part of them. A bulletin of this sort is not likely to circulate as widely as it should. In some cities a card, containing a list of fire alarm boxes, is placed in every house. The information given on page 949

might well be distributed in the same way. Mr. Charles Saville, the newly appointed director of sanitation of Dallas, is in charge of the publication of this excellent bulletin.

GENERAL INFORMATION.

Information Desired Regarding	*What To Do.*
Admission of Patients to City Hospital	Phone Dr. M. M. Carr, Resident Physician, S. W. Prest 2144, Auto. A. 1143
Emergency Cases	Phone Emergency Hospital, S. W. Main 4565, Auto. M. 4565 and M. 6030
Fumigation of Premises following Communicable Diseases	Phone Registrar of Vital Statistics, S. W. Main 8000, Auto. M. 6034
Records of Births, Deaths, and Cases of Disease	Phone Registrar of Vital Statistics, S. W. Main 8000, Auto. M. 6034.
Quality of Milk from any Dairy	Phone City Chemist, S. W. Main 8000, Auto. M. 6016.
Examination of Sputum, Blood Samples, Diphtheria, Cultures, etc.	Phone Dr. E. S. Fortner, S. W. Prest. 2144, Auto. A. 1143
Reporting of Unsanitary Premises and General Nuisances	Phone Director of Sanitation, S. W. Main 8000, Auto. M. 6019
Garbage and Refuse Collection	Phone Supt. of Refuse Collection and Disposal. S. W. Main 8000, Auto. M. 6045
Cleaning of Dry Closets	Phone City Scavenger, S. W. Main 8000, Auto. M. 6039

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The Black Hand.—*The Virginia Health Bulletin* for May is devoted entirely to typhoid. On the cover is the injunction, "Beware the Black Hand" over which the "hand" appears. The thumb is Filth; the fingers are Bad Water, Bad Milk, Carelessness and Flies. Several diagrams of sanitary privies and safe wells add to the usefulness of the pamphlet.

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A City Milk Supply.—In the editorial columns of *The Western Medical News* for June, 1915, is the announcement of a new experiment in municipal ownership.

"In recent years a great improvement has been made in the quality of the milk supplied in most of our larger cities. This is chiefly owing to the education of our people—a more intelligent and enlightened population requiring a higher standard and a purer supply. It was brought about by the vigilance of our health departments, by means of frequent inspections and numerous tests. Much still remains to be done.

"The city of Jamestown, N. Y., is grappling with the problem in a new way. It purpose making the supplying of milk to the citizens a municipal affair. The mayor is one of the leaders in the movement. The whole plant is to be owned, operated and inspected by the city. Under the old system we sometimes see three or four men delivering milk in the same city block. Under the new system this is done away with. One man will be given a certain section of the city where he will deliver milk, somewhat similar to the present delivery of mail.

"The city will own all the dairies and there will be a central depot for the testing, pasteurizing and bottling of milk.

"By the new system it is hoped to prevent overlapping, to eliminate waste and to furnish to the citizens an ample supply of pure milk at the lowest possible cost."

✻

Chicago's Municipal Sanitarium.—One of the finest municipal sanitariums in the world was opened by the city of Chicago on March 8, 1915. It has been under construction since December 11, 1911. The grounds are 160 acres in extent and will ultimately contain 28 cottages—20 for adults and 8 for children. Its present capacity is 950 beds and the staff is in a position to care for about 1,500 to 2,000 patients annually. Liberal provisions have been made for completeness. There is a maternity department, a nursery for infants of prospective tuberculous mothers, open-air quarters for employees, 10 municipal tuberculosis dispensaries, 35 dispensary physicians and 54 field nurses.

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Emulsions as Larvicides.—"The following interesting statement as to the method of action of emulsions of crude carbolic acid as larvicides is an extract (Jan. 1915, p. 8) from the Report of the Department of Public Health of the Panama Canal:

"The emulsions as they are prepared with rosin soap are suspensions of minute particles which, when external influences are eliminated, must

be considered to remain unchanged in composition regardless of the dilution. As they are formed when the proportion of water to the undiluted liquid is approximately 2 to 1, each particle must contain a relatively high proportion of toxic substances.

"The emulsions behave as typical emulsoid colloids. The particles display an energetic Brownian movement; with a membrane permeable to electrolytes, they exert a definite osmotic pressure; and they also carry a negative charge of electricity, migrating to the positive pole under the influence of an electric current; when this charge of electricity carried by the particles is removed the emulsion is destroyed. The electrical nature of the particles is essential to their existence, and it is also a factor in the suppression of the specific chemical nature of the substances composing them. It also is very closely connected with the high bactericidal value of such emulsions.

"Bacteria possess this same electrical property, but with this difference, the nature of the charge is very easily reversed. In an alkaline medium it is electronegative, and in an acid medium it is electropositive. In the presence of the particles of an emulsion of crude carbolic acid with soap, in an alkaline medium, the charge becomes positive and under the influence of the current the bacteria will travel to the negative pole. They become positive in the presence of the negative colloid and remove the charge from the particles of the emulsion. This removal causes the particles to break up, and the constituents of the emulsion are liberated around the bacteria in a concentration out of proportion to the degree of dilution."—*Tropical Diseases Bulletin*, June 15, 1915.

New Move on Alcohol.—"The strategy of the New York City Health Department's campaign against drink has been placed in the hands of an advisory committee of citizens representing a wide variety of scientific, educational and social organizations, most of which have not been identified with the temperance movement," says *The Survey* of July 3, 1915.

"Among the organizations represented are the New York State Commission for the Blind, American Association for Labor Legislation, Association for Improving the Condition of the Poor, Hudson Guild, State Charities Aid Association, Brooklyn Bureau of Charities, New York Social Center Committee, Jewish Community, Committee of Safety, Russell Sage Foundation and the Boy Scouts of America.

"Public officials include representatives of the Departments of Public Charities, Education, Police, Mayor's Employees' Committee and the State Department of Labor. Educational institutions are Columbia University, Cornell University, College of the City of New York and Hunters College. Labor is represented by the Central Federated Union, and there are representatives of the Life Extension Institute, the Metropolitan Life Insurance Company, United States Brewers Association, the army-post at Governor's Island, the Press Club and various trade groups as, the New York Wholesale Grocers' Association, the editor of the *American Druggist* and a group of leading medical men."

As reasons for the new activity of the New York Health Department, the following quotation from the *Weekly Bulletin* for June 19, 1915 is cited:

"At a recent conference attended by 200 Indiana health officers, a resolution was adopted unanimously declaring that health officers and physicians should join in the campaign against alcohol. As a matter of fact, health officials in many states are already engaged in efforts to combat intemperance by educational means, and ample justification for their activities in this field is to be found in the following facts:

"A diminution in the consumption of alcohol by the community, according to those who are in a position to know and to judge, would mean less tuberculosis, less poverty, less dependency, and less pressure on our hospitals, asylums and jails. Intemperate drinking cuts into the support of the family. The drinking of parents weakens the vitality of children. Drinking mothers lose twice as many babies as do sober mothers. More alcoholism is found in the parents of feeble-minded children than in the parents of normal children. The children of drinkers develop more slowly and do poorer school work than do the children of abstainers. Alcohol impairs the tone of the muscles, lessens the product of laborers, depreciates the skill and endurance of artisans, impairs memory, multiplies industrial accidents, causes chronic disease of the heart, liver, stomach and kidneys, in-

creases the death-rate from pneumonia, and lessens natural immunity to infectious diseases."

Diphtheria Carriers.—The following excerpt from the California State Board of Health *Monthly Bulletin* for May is of very practical public health interest:

"The control of the chronic diphtheria carrier is a more serious problem than his discovery. Health officers of California can save themselves much trouble by following strictly the regulations of the California State Board of Health for the prevention and control of diphtheria (Special Bulletin No. 6). In the regulations a distinction is made between the acute case of diphtheria and the chronic carrier. It is neither practicable nor desirable to keep all diphtheria carriers under complete quarantine for an indefinite period of time. It is usually not necessary to quarantine the entire premises of a chronic diphtheria carrier, if the health officer will make a plan, to suit the conditions, whereby the carrier can have a limited freedom without endangering others. This plan should be submitted to the State Board of Health for approval. Rulings regarding carriers must of necessity be adapted to the special case. Often a carrier living in a farmhouse can safely be given almost complete freedom, while one in a crowded tenement will sometimes need rigid quarantine. Through the composite of the many experiences of health officers there will gradually be evolved more efficient methods for controlling carriers.

"The experience of Dr. W. E. Coppedge, health officer of Alturas, illustrates the manner in which the number of diphtheria carriers is greatly increased in the presence of a few cases of diphtheria, and how some of our local health officials are doing constructive and successful work in controlling this disease. Recently a very few cases of diphtheria appeared among the school children in Alturas, and Doctor Coppedge at once saw the danger and took steps to exclude all carriers from school. Cultures were taken from the school children and sent to the State Hygienic Laboratory. It was found that 16 per cent. of all the children had become carriers. In the classroom of one of two boys who were supposed to have brought the disease into the school, 28 per cent. of the children were carriers.

"The exclusion of all these carriers, together with the absence of children who were kept at home by their parents, seriously diminished school attendance. The loss of instruction to the children who were excluded and the threatened loss of a teacher owing to the reduction in attendance led Doctor Coppedge to plan a separate school for the carriers where they could get instruction under adequate supervision until their throats and noses became free from diphtheria bacilli. This plan was approved by the State Board of Health, but was given up owing to the opposition of people living near the proposed school for carriers. Fortunately all of the carriers soon cleared up and were able to go back to school."

The Care of the Baby.—In the June issue of *Public Health* published by the Michigan State Board of Health, there is a very interesting article on "The Care of the Baby." The author of this article sets forth nineteen things which he calls "Foes of the Baby." Then follow fourteen topics under the title "The Baby's Friends." The lists follow:

Foes of the Baby.

1. Habits of mother.
2. Bad housing conditions.
3. Impure air.
4. Unwholesome milk.
5. Impure water.
6. Mothers who dope their young.
7. Law-makers who oppose measures for the safe-guarding of human life, especially that of children.
8. Parsimonious taxpayers who place the hoarding of money above measures for the protection of the lives of children.
9. Dirty milkmen and milkmen who put preservatives in milk, or those who sell milk from tuberculous cows.
10. Flies and mosquitoes.
11. Dust.
12. Over-exposure to heat.
13. Mothers and fathers who expose their children to contagious diseases on the absurd supposition that a child must have such disease.
14. Violation of quarantine.
15. People with venereal diseases.
16. People who sell and drink intoxicating liquors.
17. Dirty parents with the natural sequence of dirty homes.

18. Poverty.

19. Women of the rich who care more for a dinner party or some other social function than they do to nurse and mother their children.

The Baby's Friends.

1. Mothers who are not too proud to suckle their young.

2. Health officers, both state and local.

3. The United States government through the medium of the Public Health Service, and its health publications in the agricultural department, but more especially by its children's bureau.

4. The visiting nurses who visit pregnant mothers and instruct them as to the proper care of themselves and their offspring.

5. Little Mother classes, and Little Mother leagues.

6. Mothers' classes as a part of child welfare work.

7. The attention directed to babies by the grange, mothers' clubs, women's clubs and various other civic and benevolent agencies.

8. Newspapers which use their columns to promote good sanitation and healthy conditions of living.

9. The people who lead the war upon flies and mosquitoes.

10. Cities that take care of their garbage and sewage properly and safeguard their water supply.

11. Milk stations and baby clinics.

12. Pregnancy clinics and floating hospitals.

13. Distribution of literature such as department bulletin and pamphlets and

14. Mothers' pensions.

⚜

Model Law for Morbidity Reports.—The Public Health Reports of the United States Public Health Service for July 2, contains a draft of a "model law" to provide for the notification of the occurrence and prevalence of certain diseases. The diseases which it is proposed to make reportable are classified in three groups, communicable diseases, occupational diseases and injuries, and miscellaneous. Under this latter group are included the following five titles: Beriberi, cancer, continued fever lasting seven days, drug addictions or habits, and pellagra. It is made incumbent upon physicians, midwives, householders and schoolteachers to report cases of disease or presumable disease to the proper authorities. The proposed law would seem on brief examination to be an excellent one, but it is probably not a great improvement on the present laws of some of the states which are most advanced in public health matters.

⚜

More War on Typhoid.—"A movement is now on foot," states a recent press article of the North Carolina Board of Health, "to have all federal employees vaccinated against typhoid fever. This will be an army of 400,000 men and women. Secretary of the Treasury, W. G. McAdoo, has designated 164 stations in the United States where any federal employee may be given the treatment free of all cost.

"Reckoning the period of immunity for four years and basing the calculation upon what has already been accomplished, the secretary sees where the compliance with this offer will save 300 lives and at least 3,000 people from periods of invalidism. The records show that six federal employees die each month from typhoid fever. There are seventy new vacancies to be filled every year due to this one disease alone. As most cases follow the vacation season, special emphasis is given the importance of being vaccinated before the vacation season begins.

"So valuable has the use of anti-typhoid vaccine proven, not only as a life-saver but as a time-saver as well, that federal authorities and big corporations, particularly our cotton mills and large manufacturing establishments, are now considering it a wise investment to have all their employees inoculated against typhoid. One of the first things the Panama-Pacific International Exposition authorities did was to have all employees on the grounds inoculated against typhoid early in the year. This was done by March 31, and the wisdom of this precaution is now being felt."

⚜

Utilizing Police for Health Work.—Following a notice to the effect that the Department of Police and the Department of Health in Chicago will coöperate in the future—a recent issue of the *Bulletin* details the plan to be carried out.

"The policeman who travels his beat is the one city official that is in constant daily touch with the people of the community in which he works. Necessarily, too, he is or should be better informed as to the physical conditions of the

neighborhoods that he covers in his daily rounds, than any other city employee.

"Because this is true and because it is putting into practical effect the idea of closer coöperation between the different branches of the city service, the commissioner of health, the superintendent of police and the superintendent of streets are now formulating a plan by which the entire police force of the city will work in a constructive and coöperative way with the Department of Health in the great work of community sanitation. In other words, it is planned that police officers, in addition to looking after violations of the criminal code of the city, shall also give to the Department of Health the benefit of their observations as to physical conditions in the various communities that they serve throughout the city.

"The Department of Health has never been able to do, except in a very limited way, what is known as volunteer or pickup work. Nearly all of the time of the inspectors is taken up in investigating complaints, so that little time is left for anything like a thorough canvass of any given locality for the investigation of general sanitary conditions.

"It has been worked out that the police will be able to report to the Department of Health such violations of the sanitary ordinances as come under their observation without imposing any very heavy additional duties. Also that in very many instances, perhaps practically all violations of a minor character, the police will be able to secure corrections and abatements without the Department of Health being compelled to resort to the slow process of serving notices and following these up with suits in the courts. It is believed with the growing spirit of coöperation on the part of the people themselves, that when police officers call the attention of citizens to violations, for example, such as fly-breeding manure piles, dirty premises, improper care of garbage and refuse, etc., prompt compliance will be given on the part of the citizen to such notices."

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Vermont's New Law.—On March 25, 1915, the Vermont legislature enacted the following—one of the most drastic efforts in the country—for the solution of the venereal disease problem:

"A person who, knowing himself to be infected with gonorrhea or syphilis, marries, shall be fined not more than $500 or imprisoned in the house of correction for not more than two years.

"A person who, while infected with gonorrhea or syphilis, has sexual intercourse, shall be fined not more than $500 or imprisoned in the house of correction for not more than one year.

"A physician who knows or has reason to believe that a person whom he treats or prescribes for is infected with either gonorrhea or syphilis, shall immediately report the name, address, age, and sex of such person to the secretary of the State Board of Health, for which report he shall receive the sum of 25 cents, to be paid by the State Board of Health. A physician who fails to make such report shall be fined not more than $200.

"The State Board of Health shall make and enforce such rules and regulations for the quarantining and treatment of cases of gonorrhea and syphilis reported to it as may be deemed necessary for the protection of the public. Said board shall not disclose the names or addresses of persons reported or treated to any person other than a prosecuting officer or in court on prosecution under this act.

"The sum of $1,000 is annually appropriated for carrying out the provisions of this act."

✤

Health Workers Must Take Their Own Medicine.—Mr. Health Officer, are you like "Pat"—who is referred to in the North Carolina Health Department Bulletin quoted herewith, or are you applying your knowledge of *personal* hygiene to your own life *every day*?

"Practice what you preach" is another one of those homely bits of advice that we are always running up against. This particular one is handed out to public health workers almost as frequently as it is to preachers themselves, and not without grounds, we'll have to admit. For instance, the other day, "Pat," the famous anti-typhoid cartoonist whose clever work has been attracting attention through numerous papers of the state and whose advice through his cartoons has been inducing scores of people to take the anti-typhoid treatment as a preventive of typhoid fever, wrote to the State Board of Health, this:

"I have been knocked out for the past week and am still indisposed. Doc says 'fever'; probably so. It's antitoxin for me soon as I get able. Really had planned to start taking it just when I got knocked out."

We ourselves could hardly forego the pleasure of advising him to first practice what he preached but we thought he was learning the lesson well enough first hand.

Another instance in which the same advice was recently sent straight home was in the case of one of the doctors at one of the anti-typhoid dispensaries. A young fellow who wanted to be sure he was making no mistake in taking the vaccine treatment questioned carefully one after another of those assisting and administering the vaccine as to whether or not they had taken it. Finally, the young fellow came to the doctor who was giving the injections and when he so sternly put the question up to him, the doctor, who we regret had never taken the treatment, was nonplussed. Now Nature had dealt very sparingly with this particular doctor in the matter of superfluous flesh and by reason of hot weather and overwork he became still more emaciated. To sidestep the question, he wriggled out only by saying that he had so little flesh on his bones that he doubted if there could be found a spot big enough in which to make the injection and that it would not do to put it in the bone. The boy looked the doctor over and sympathetically walked away. Whether he thought the doctor was so devoid of flesh as not to be worth saving from typhoid, we never learned. Not long after, however, the doctor, too, took the hint and followed his own advice.

⚜

Worth Watching.—"When the Rockefeller Sanitary Commission," quotes the *Social Service Review* for June, 1915, "concluded its five years of work in the South last winter, the International Health Commission was organized to carry on sanitary investigation in America and abroad. After careful study of conditions the Commission decided to begin intensive campaigns in various states, the object of which should be to illustrate by the eradication of certain communicable diseases the economic importance of public health work.

"At the invitation of the State Board of Health, the International Commission agreed to start such a campaign in Virginia under the direction of the board, and to supply the greater part of the funds necessary. Work was accordingly begun in a district of Southampton County, where a trained health officer and two assistants have been engaged in a canvass of the community, farm by farm, in order to encourage the installation of sanitary devices and to rid it of filth-borne diseases. This work has succeeded so well that the Commission has now agreed to organize through a 'unit' in a selected Virginia community. The salary and expenses of the health officer in charge and the salaries of necessary assistants are paid with funds from the Commission, the incidental expenses are borne by the state, the community is only asked to pay the traveling expenses and the board of the assistants, a total of about $250 for a complete campaign.

"The problem now before the board is to select that progressive Virginia community which is most anxious for a general campaign of sanitary improvement, and will make its contribution to that end. In return the board can practically give assurance that with public coöperation, hookworm disease can be made to disappear, fly-borne typhoid can be eradicated, infants' complaints can be decreased, and the general health of the community can be greatly improved."

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"Good Water for Farm Homes."—Public Health Bulletin No. 70 with the above title made its appearance in May and is a pamphlet which all county health officers, at least, should advertise and distribute. The author, A. W. Freeman, epidemiologist of the United States Public Health Service, has compiled a brief sixteen-page, admirably illustrated bulletin, thoroughly unburdened of all technical language and treatment.

In the same connection, a reprint from the Yearbook of the Department of Agriculture for 1914 ought to be mentioned. The article entitled, "Clean Water and How to Get It on the Farm," by R. W. Trullinger, is a most able and useful treatment of the subject. The questions of practicability, convenience and cost are always considered, but never to the neglect of that of health.

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The Question of Clean Milk.—The following opinion of H. E. Barnard, State Food and Drug Commissioner of Indiana, expressed at the last annual convention of the International Association of Dairy and Milk Inspectors, is worthy of thought:

"Am I overstating when I say that there has

been a feeling on the part of the producer that the public will not pay a better price for a clean milk than it will pay for dirty and unwholesome milk? This has no doubt been true. The price of flour has varied with its breadmaking qualities; the cost of meat depended on the cut; the character of fruit fixes its market value; but the price of milk is arbitrarily set by custom and is dependent on no standard of composition, excellency or purity. Milk is milk, and whether it is produced in accordance with the best principles of dairy practice or drawn from poorly nourished, diseased cows, stabled in filthy barns, the customer has cared little so long as he gets cream for his coffee and a white fluid for his children. This lack of concern on the part of the consumer has made it possible for the dairyman with slovenly habits and a poor equipment to compete with the man who is trying to produce a high grade milk, and as a result the price of milk has been fixed close to the cost of production under the most unsanitary conditions.

"We can hardly hold the municipalities responsible for the consumer's lack of appreciation of the fact that clean milk is worth what it costs. But until milk is bought on that basis the efforts of the milk inspector must be largely punitive. The health authorities can only control the milk supply by denying the dirty dairy a market and by punishing the man who sells dirty milk. The experience of a thousand cities finds little real progress in such methods of control. Each year I am becoming the more convinced that the ultimate settlement of the question must come from within rather than from without, that is, that the problem of a pure milk supply rests with the dairyman rather than with the inspector. Like morality, clean milk will come not as a result of legislation, or of state or municipal control, but of education."

Babies vs. Flies and Dirt.—From a careful analysis of a three months' study, the object of which was to determine the real relationship of flies and filth in their separate and combined influence on infant mortality—the New York City Health Department feels justified in the following conclusions—as outlined in the *Weekly Bulletin* of June 19, 1915:

Fly Factor.—Almost twice (1.9) as many infants were attacked by diarrhea among fly-exposed as among the fly-protected infants.

Dirt Factor.—The group of influences other than flies and artificial feeding, associated with a dirty home and designated as the "dirt" factor, play a similar part in diarrheal incidence among infants. Almost twice (1.8) as many infants were attacked by diarrhea in dirty homes as in the clean homes.

Artificial Feeding Factor.—Of somewhat greater importanc is the influence of artificial feeding. Almost two and a half (2.4) times as many infants were attacked by diarrhea among the artificially fed as among the breast-fed infants.

Flies and Dirt Factor.—The influence of flies and dirt combined is of similar importance to that of artificial feeding. Almost two and a half (2.4) times as many fly-exposed infants in dirty homes were attacked by diarrhea as fly-protected infants in clean homes.

Dirt and Artificial Feeding Factor.—The influence of dirt and artificial feeding combined is still greater. Three and a half (3.5) times as many artificially fed infants in dirty homes were attacked by diarrhea as breast-fed infants in clean homes. (In this case, however, the influence of fly exposure is not eliminated.)

The above is important in as much as it is the first really reliable information worked out from so large a number of observations.

Public Health Notes.

The County as the Unit in the Tuberculosis Campaign.—George J. Nelbach of the New York State Charities Aid Association says that the tuberculosis problem is one largely for local authority and that the county as a political unit has great responsibility in the antituberculosis movement. On account of the immensity of the problem and the great expense connected with it the county is the most practical unit to deal with it, and as already provided for in some states, the county should not only establish an institution for the care and treatment of tuberculosis, but such hospitals should be the center of the organized movement against the disease in the community. It should assume complete responsibility for the discovery and diagnosis of cases and for their care, for the friendly oversight of discharged cases, for the sanitary and medical supervision of patients in their homes, and for a continuous campaign of health education.—*Journal American Medical Association*, July 24, 1915.

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The Public Health Profession.—In an article appearing in the *Journal of the American Medical Association*, July 24, 1915, Prof. M. J. Rosenau of Harvard calls attention to the fact that in only three medical schools, University of Pennsylvania, University of Michigan, and Harvard, is hygiene included in the curriculum as a major subject. The author notes that the training received for the M. D. degree does not qualify a man to enter public health work. Indeed he states that, "Sanitation and hygiene has become a separate profession." The article proceeds to discuss the value of a sanitary survey in the teaching of hygiene.

The employment of a full-time health officer in the small city or village is not a common thing throughout the United States and the fact that this is generally known is probably the principal reason why the number now preparing for the "separate profession" of which Professor Rosenau speaks is so small.

When a new field of work—especially one requiring expert training—is just opening up, the supply of workers will generally be forthcoming only after it is clear that there is a continuing demand and that the remuneration is substantial.

The specific is the one which must be indicated in most of the pathological conditions in the body politic—*education*. Education of the public concerning community health needs will create the demand for men trained in the separate profession of hygiene and sanitation, then many institutions will be quick to institute courses of this sort.

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The Use of Words.—The subject of the Chairman's address before the Section on Practice of Medicine at the late meeting of the American Medical Association at San Francisco, by Dr. Thomas McCrae, Philadelphia (*Journal A. M. A.*, July 10, 1915), was the use and abuse of words. He called attention to the many disputes which have arisen where the use of words was involved, and held that we should use a rigid standard, especially in medical matters. Many people have their own peculiar conceptions of terms, and words are given attributes they do not possess. For example, the word pneumonia involves quite a variety of conceptions in the minds of different persons. In a meeting of medical teachers ten years ago the terminology of the diseases of the chest was discussed and the varied meanings attached to the same term brought out in the discussion surprised everyone. Much difference of opinion will be found in the use of the words bronchial and tubular, and students have been graduated for years with erroneous ideas as to the meaning of a certain term. Many illustrations are given by McCrae as to the misuse of the names of diseases and symptoms. He says if one wishes to find confusion worse confounded let him read an article in French or German dealing with arthritis. What the term rheumatism means in many of these no one but the author can tell. The use of the word rheumatism leads to careless diagnosis, and the list of diseases and conditions which have been classed under this head is a long one. The word phthisis is another misused term, as well as Bright's disease, asthma, bilious and biliousness, typhoid, hysteria, etc. (all of

which have numerous meanings), and many others which need to have some attention as to clearness in regard to their use. For those who are teachers the duty of accuracy in the use of words is important. How can definite ideas be conveyed by indefinite terms? For proper therapy it is equally important to have clear ideas. Treatment directed to a name is not likely to help the patient. When so much depends on the choice of terms is it not worth while to use them with care and precision?

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Midwives and Blindness.—A recent bulletin of the New York Committee For the Prevention of Blindness contains this note with regard to midwives:

Midwives.

These women attend about half the births occurring in this country, and the majority of them are dirty, ignorant and generally unfit to assume the care of mothers and babies. Although the carelessness of many physicians is equally reprehensible, it is due in great measure to the ignorance and neglect on the part of midwives that many babies become blind from babies' sore eyes.

1. Are there midwives practising in your community?

2. Are they registered by an official body?

3. Is it required that they be adequately trained; pass an examination; obtain a license; and register before beginning to practise?

4. Has your community a midwife training school connected with a good hospital?

5. Do the practising midwives give clean, careful nursing care to mother and child, and instruction to the mother concerning hygiene of pregnancy and care of her child?

6. Has the state or city health department adopted rules regulating midwives' practise in detail and requiring them to summon a physician in all but normal cases?

7. Are there inspectors to enforce the rules and give helpful advice to the midwives?"

The committee is endeavoring to secure the widest possible circulation for its bulletins, which are excellently prepared and should be of great value in educating the public on the matter of unnecessary blindness.

Bibliography on Garbage and Refuse Disposal.—*Municipal Engineering* for July, in its Question Department, gives the following useful bibliography in answer to a question concerning garbage and refuse disposal methods:

Information about the higher-temperature destructors can be obtained from such firms as The Destructor Co., 111 Broadway, New York; J. B. Harris, 65 Life and Casualty Bldg., Nashville, Tenn.; Atkinson-Morse Destructor Co., 30 Church Street, New York; Morse-Boulger Destructor Co., New York. Information about lower-temperature incinerators may be obtained of the Decarie Co., Minneapolis, Minn.; The Dixon Engineering Co., Toledo, O., and others. Information about reduction plants is available mainly from the municipal plants at Cleveland and Columbus, O., and will be later from the new plant at Akron, O.

There are a number of recent projects for disposing of garbage by chemical treatment, by maceration, by pulverizing, followed if necessary by drying, producing fertilizers or base for fertilizers. Some of these have been described in *Municipal Engineering*. Some recent articles are given in the following list:

In Vol. xlviii: Garbage Reduced to Fertilizer, p. 299; Making Fuel Out of Garbage, 304; Garbage and Refuse Collection and Disposal in St. Louis, Mo., 340; Disposal of Garbage and Refuse in Seattle, p. 118; Garbage Disposal for North Yakima.

In Vol. xlvii: Street Cleaning and Refuse Disposal in Philadelphia, p. 19; Profitable Conversion of City Garbage, p. 25; Vancouver Garbage Collection and Disposal Ordinance and Methods, p. 41; The Harris Municipal Garbage Incinerator and Steam Generator, p. 72; Garbage Incinerators and Destructors, p. 114; Garbage Disposal by the Hirsh Chemical System, p. 131; Refuse Destructor at Clifton, Boro of Richmond, New York City, p. 207; Garbage Reduction Systems, p. 291; Plants Making Fertilizer from Garbage, p. 292; Methods of Collection and Disposal of Garbage, p. 292; Domestic Refuse Destructor, p. 413; Refuse Destructor at Savannah, Ga., p. 416.

Two or three of these articles give references to previous articles and classified lists of the same, including one on Mixed Method Garbage and Waste Disposal in Vol. xlv, p. 25.

All the articles named above are descriptions of modern practice or of new method of more or less value which have been tested or are seriously proposed for test.

Morse's "Collection and Disposal of Municipal Waste" (85) was at the time of its publication, 1908, the most complete record of operations in the United States covered by its title. Parson's "Disposal of Municipal Refuse" (82) is a statement of New York practice. Venable's "Garbage Crematories in America" (82) gives a full list of patents and descriptions of the plants using them up to 1906. Goodrich's three or more books give English destructor practice with brief mentions of American work of similiar nature.

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Infections of the Tonsils.—The following is a summary of an article by F. C. Pybus in the *Lancet* of May 22:

"In the course of an extensive discussion of the various infections of the tonsils, Pybus cites statistics which show that 10 per cent. of all school children in London were found to have tonsils sufficiently enlarged to demand surgical treatment. There is also a close relation existing between the number of carious teeth in children and the presence of enlargement of the tonsils. Thus, only 42 per cent. of children free from carious teeth showed any enlargement of the tonsils, while this was present in 67 per cent. of children with five or more carious teeth. Again, in children twelve years old nearly 23 per cent. more with enlarged tonsils had carious teeth than among those free from tonsillar enlargement. It has also been shown that tonsillar hypertrophy is materially reduced by the institution of proper oral hygiene. Enlarged tonsils may project beyond the pillars of the fauces to such an extent as to make their recognition certain and easy, but they may be equally enlarged and still not project. It should be a matter of routine when examining children, therefore, to make them gag in order to bring forward imbedded, enlarged tonsils. Some estimate of the degree of septic infection of the tonsils should be made in every case in which they are enlarged. This is best accomplished by examining the lacunæ with the aid of a bent probe. A series of tonsils which had been removed for hypertrophy were examined and 60 per cent. of them were found to be grossly infected."—*New York Medical Journal*, June 12.

*

Another Summer Course for Health Officers. During the last part of July and first part of August a summer normal course for city and county health officers and others interested, was conducted at the University of Texas. The program consisted of lectures on municipal health, organization and administration of public health, public health laws, vital statistics, anti-narcotic law, human carriers of disease, epidemiology, purification of water supplies, plumbing and sewers, septic tanks, vaccination, rabies and its treatment, infant feeding, baby welfare, sex hygiene, laboratory diagnosis, medical supervision in public schools, serums and bacterines, rural homes, school hygiene and sanitation, rural health problems and pure foods.

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Tetanus Carriers.—"From observations made in the laboratories of the Sheffield Scientific School of Yale University, Noble," says *The Journal of the American Medical Association*, for May 29, 1915, "has reached the conclusion that the tetanus bacillus appears in the intestines of many normal animals, especially of the herbivora. Apparently it is impossible, with the current technic available, to detect the microorganism unless it is present in relatively large numbers. Park states that 15 per cent. of horses and calves in the vicinity of New York City harbor tetanus bacilli in their intestines. Noble found that eleven out of sixty-one horses examined, or 18 per cent., showed this organism in their feces. He failed to find them in the excreta of cows; but the investigations on this species were not conclusive, because they were made on a herd of cattle confined in a barn during the winter months when the diet of ensilage was such as to exclude the probability of its containing tetanus spores.

"Noble is inclined to the belief that the tetanus bacillus may multiply within the intestines of suitable animals. Some of these seem to offer especially favorable conditions for this growth. Tests on two selected horses showed that the tetanus spores disappeared from the feces of one fourteen days after the beginning of the observations; whereas the other animal harbored them

continuously for four months, although, here too, they eventually disappeared. It is highly improbable that this persistence was due to repeated reinfection, because other horses in the same stable showed no signs of fresh invasion by the tetanus bacilli.

"If these observations are valid in demonstrating that individual horses may harbor tetanus bacilli in their alimentary tract for many months following an initial infection, the phenomenon would appear to present the case of a 'tetanus carrier' comparable with the well-known typhoid carriers and other seemingly healthy disseminators of human infection. How common the 'tetanus carriers' may be among horses remains to be ascertained; but, as Noble contends, if we grant their existence, the universal distribution of tetanus spores is not difficult to explain. In any event, the presence of these forms in soils, street dirt, fresh vegetables, on the clothing and the skin is easily attributable to fecal contamination, as has so often been maintained."

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Physicians and Public Health.—An excellent article by John W. Trask, Assistant Surgeon General, entitled "The Practicing Physician, His Relation to Public Health Administration," appears in the *Public Health Report* for June 11, 1915. He traces the development of public health. He names the purpose of the health department as the control of "disease in the community" and goes on as follows:

"Now, inasmuch as the health department cannot do its work without information of the occurrence of cases of the controllable diseases and inasmuch as this information can be had only through the reports made by physicians of the occurrence of cases in their practice, the physician becomes an essential part of any scheme of public health administration. The practicing physician is essentially a part of the health department. This is true, whether the physician recognizes it or not, and whether the community recognizes it or not. The physician is the outpost, the picket that must give to the health department information of the approach of the enemy, his numerical strength, and his armament.

"Coöperating with an efficient health officer the practicing physicians of a community have it within their power to make the efforts of the health department successful or to make their success impossible. So important is the control of disease to the welfare of the community, and so essential is the coöperation of the practicing physician through the reporting of cases, that it may be taken for granted that intelligent communities will bring about a satisfactory coöperation in this work between the physicians and the health department. It is only a question whether a public spirited, humanitarian medical profession will take the initiative and voluntarily and cheerfully accept and carry out its responsibilities, as it undoubtedly will. Any other course is inconceivable. Certainly upon the attitude of the medical profession in this matter will largely depend its relations to the community in the future."

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Interstate Migration of Tuberculous Persons.—It seems to be the general opinion of those who have studied the subject, that care without climate is a far better cure for tuberculosis than climate without care, this being the chief point raised in a series of articles which has appeared in the United States Public Health Reports under the title of "Interstate Migration of Tuberculous Persons."* These articles are the reports of investigations undertaken during the years 1913 and 1914, and cover various sections of the country. A. D. Foster undertook the work in North and South Carolina, P. M. Carrington in California, E. A. Sweet in Texas and New Mexico, and A. J. Lanza in Arizona and Colorado. Their object was to determine:

1. The extent and direction of such migration;
2. The effects of travel on tuberculous persons themselves;
3. The bearing of the migration of tuberculous persons on the health of other travelers and on employees of common carriers;
4. The condition under which tuberculous persons live in localities resorted to for change of climate and the effects of these conditions on the progress of their disease.
5. The bearing of the presence of tuberculous persons on the health and on the social and eco-

* United States Public Health Reports, Mar. 12, 1915; Mar. 19, 1915; Apr. 9, 1915; Apr. 16, 1915; Apr. 23, 1915; June 18, 1915.

nomic status of communities to which they have migrated in search of health.

6. The degree of forced migration of indigent tuberculous persons from communities hostile to their presence.

Tuberculous travelers naturally fall into two large groups—those who are well-to-do, and those who are not. The former are, in this discussion, a negligible factor; they travel most comfortably, are constantly under adequate medical supervision, have no financial troubles, and may thus devote their entire attention to getting well. They are welcomed everywhere for it is due to just this class of persons that a great many communities in the West and Southwest have been built up.

Those of the second class, who form, unfortunately, the vast majority of those in search of health, present a far more complicated problem. The prevalent idea among them is that one has merely to go to the resort town most highly recommended and that the climate will do the rest. They do not realize that the only way to use climate is to be out in it, every day all day, and every night all night. Some arrive at their destinations with very little money and expect to find employment, not thinking, or perhaps not knowing that, should they be successful in this attempt, they will thereby lose that most necessary of all things—complete rest. There are others whose implicit faith in the curative powers of climate leads them to think that they can do without many of the comforts to which they have been accustomed at home and go without even sufficient nourishing food, thereby cutting off another avenue to recovery. Very few of this poorer class know that they should be under constant medical supervision and may let a fever run for months without ever consulting a doctor. Practically all of them worry about their financial difficulties, and many become despondent over the separation from family and friends. For their own sakes, as well as for the sake of the community on which many at length become dependent, it would have been far better had they stayed at home.

The authors are unanimous in their decision that physicians should never recommend a change of climate unless they are sure that the patient can well afford it, and is in such a stage of the disease that the trip itself will have no ill effects upon him. They should rather teach their patients that intelligent attention to hygiene is more important than the climate they happen to live in and that money spent in railroad fare and board away from home would be of infinitely greater benefit if spent on nourishing food at home with the family, or among friends who are really vitally interested in the recovery of the patient. The excellent care given will procure results which will far outweigh the supposed benefits of climatic change.

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A Half Century of Antiseptic Surgery.—"Those who fail to recall the historical development of the modern surgical technic," says *The Journal of the American Medical Association*, in a comment on the semicentenary of the introduction of aseptic surgery, "are sometimes wont to assume that because certain current aseptic procedures have entirely superseded the antiseptic devices introduced by Lister, the advantages of his precautions are no longer essential. It must be remembered, however, that antiseptic and aseptic are nothing other than two ways of arriving at one result. In the words of Sir William Osler: 'It is the difference between tweedledum and tweedledee. They are both applications of the same principle.' We cannot summarize the situation better than by quoting Paget. It is true, he writes, that Lister was more afraid of the powers of the air, half a century ago, than surgeons are now; it is true that his use of a phenol spray, to sterilize the air around the wound, has been given up; but the law of all operations remains today that law which was revealed to him in 1865, in the light of Pasteur's work on putrefaction. From the very first, antiseptic surgery had in itself the making of aseptic surgery.

"The principles defended and applied by Lister find applications in everyday life at the hands of the layman; their value is further attested in the prominence which they play in modern military régime. The soldier on the European battlefields has been taught to apply an antiseptic dressing promptly to the wound he has received in action, and the enlightened teachings of Lister follow him through all the subsequent stages of his treatment to recovery. After a lapse of fifty years we may well pause to recall that Lister was instrumental in saving more lives than the armies of the greatest general or potentate have destroyed. Let us

mark the anniversary on our medical calendar and pay a tribute to the masterful genius of Lister, 'a man serene through controversy, a spirit of invincible patience and of radiant purity.'"

Meningococci in Nasal Cavity of Horses.—The *Riforma Medica*, May 29, 1915, contains an article by L. Mazzetti relating an experience among Italian soldiers.

"Of 2,000 soldiers in camp, 800 were found to be carriers of meningococci. The sole source of contagion would seem to be the nasal mucous membrane whence the germs are disseminated by sneezing, coughing, spitting, even by talking. An attack of coryza greatly increases the number of cocci and therefore enhances the danger of infection. Discovery of the fact that cavalry soldiers were much more frequent carriers than infantry prompted the examination of the nasal cavities of their horses, with the result that a large number were found to be carriers of meningococci. It would seem to be demonstrated that human carriers may infect horses which in turn infect other horses as well as human beings."—*New York Medical Journal.*

Public Health Improvements Following the Disinfection of Water Supplies.—Interesting statistics dealing with the above subject have recently been presented before the New York Section of the American Water-Works Association by F. F. Longley of the firm Hazen, Whipple & Fuller. These statistics were based on more than one hundred replies received from inquiries sent to the water-works throughout the United States and Canada. Eighty per cent. of these water-works use hypochlorite of lime and the rest liquid chlorine. The following statements describe improvements which have resulted at various places:

"In Cleveland, Ohio, the chlorination of the water-supply started in September, 1911. In the six calendar years prior to this the typhoid death-rates had varied from 13.0 to 20.2, with an average of 16.5 per 100,000. In the three calendar years following, the typhoid death-rates were from 6.2 to 13.5, with an average of 9.2 per 100,000.

In Evanston, Ill., disinfection was first applied in December, 1911. The statistics at hand cover the period of four years prior to this, and three years thereafter. The death-rate from typhoid in the former period varied from 24 to 33, averaging 29 per 100,000. In the period since disinfection it has varied from 6 to 15, with an average of 12. The death-rate from gastro-enteritis during the former period varied from 25 to 73, with an average of 49 per 100,000; and in the latter period with disinfection varied from 11 to 40, with an average of 30.

In the city of Baltimore there has been a decided reduction in the typhoid mortality since the use of calci hypochlorite. It was first used in June, 1911. In the five years prior to that the death-rate from typhoid varied from 33 to 42 per 100,000, with an average of 35. In the three years since, it has varied from 22 to 24, with an average of 23.

In Poughkeepsie the disinfection of the supply was first begun in 1908 in the form of hypochlorite applied to the water before sedimentation and filtration. The death-rate from typhoid fever for eight years prior to 1908, as indicated by the United States Census reports, varied from 25 to 114, with an average of 54 per 100,000. From 1908 to 1913, with treatment as stated above, the typhoid death-rate varied from 10.3 to 33, with an average of 18.5. Since early in the year 1914 the filter effluent has also been treated, first by means of hypochlorite, and latterly by means of liquid chlorine, and the death-rate from typhoid fever for that year was 3.4 per 100,000.

Trenton, N. J., is one of the most striking cases of improvement due to disinfection. Prior to 1912 the city used the raw Delaware River water. In December, 1911, the authorities commenced to treat the water-supply with hypochlorite. During the five years ending with 1911 the total annual number of typhoid cases varied from 208 to 343, with an average of 267. During the three years since disinfection has been applied, the number of cases in the city has varied from 45 to 110, with an average of 74.

In Ottawa the water of the Ottawa River was used without treatment until about March, 1912. Its polluted condition was evidenced by the several epidemics of water-borne typhoid that the city had been through just prior to that. Since the disinfection of the supply, Ottawa has had no further epidemics and only a moderate death-rate from typhoid.

The city of Hull, with only about one-twen-

tieth the population of Ottawa, lying on the opposite bank of the river, takes its water-supply, untreated, from the same channel as does Ottawa and within a few hundred yards of it. In two recent months Hull has had about 200 cases of typhoid fever, as against 28 in Ottawa for the same period."—*The American City*, May, 1915.

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Anti-Tuberculosis Legislation in Missouri.—At the last session of the Missouri legislature, five bills were passed dealing with tuberculosis. Two of the bills deal with the state as a whole; one provides for state-aided county tuberculosis hospitals, the other permits city councils and the county courts to employ visiting nurses for tuberculosis cases. The three other bills, applying to the lead and zinc mine districts, provide for the suppression of dust in the mines, for individual drinking cups and sanitary devices, and for adequate bathing facilities and dressing rooms.—*The Survey*, May 22.

✱

Gasoline to Prevent Wound Infection.—The *Presse Medicale*, April 1, contains an article by Doctor Eynard which recommends gasoline for removing the fatty material from the wound and skin surface before the application of tincture of iodine and a septic dressing. The gasoline is not irritating to the wound or to the hands of the attendant and leaves the tissues dry and receptive to the action of iodine. It is less volatile, dangerous and expensive than ether.

✱

Protective Substances of Milk of Animals Immunized against Tuberculosis.—The *New York Medical Journal* gives the following summary of an article by L. Sivori:

"Experiments on immunized cows show that antigens and antibodies are found in the milk, though not in such quantities as in the blood. These experiments verified the findings of Figari and Ricci that antitoxic and agglutinating materials from one animal produced specific antibodies in the milk of other animals injected with them. Further, animals born of nonimmunized mothers, fed with the milk of immunized animals, showed antitoxins and agglutinins in their serum, thus proving absorption of such bodies from the gastrointestinal canal."—*Riforma Medica*.

Industrial Hygiene and Sanitation.

Scaffold Rope Testing.—The *Edison Monthly* for July contains a short article entitled "For Scaffold Safety." This article calls attention to the fact that there has never been a law that required any particular kind of examination or testing of rope and states that hundreds of workmen are injured each year in accidents due to worn and rotten rope. The article proceeds to describe a rope-testing devise by means of which every part of a given rope may be tested for any desired maximum tension.

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Industrial Accidents.—The Committee for the Prevention of Blindness has issued a circular entitled, "What Women's Clubs and Nursing Organizations Can Do to Prevent Blindness." The following is an extract from it:

"Many good workmen are seriously handicapped and even become public charges as a result of losing one or both eyes in an accident that might have been prevented. Men, women and children often suffer from severe eye-strain because they are not provided with adequate light while at work.

"1. Are workmen in the factories and shops in your locality protected from eye accidents by goggles; guards on emery wheels; screens to catch flying chips; guards on water gauges; etc.?

"2. Are the factories, workshops and workrooms adequately lighted?

"3. Are workmen examined to see that they are not especially liable to accidents because of defective vision?"

The following regarding the effects of wood alcohol is from the same bulletin:

Wood Alcohol.

"Wood alcohol is a poison which may cause blindness or death if swallowed, or if its fumes are inhaled in an inadequately ventilated place.

"1. Have you a law forbidding wood alcohol to be sold in any form without a poison label and warning?

"2. Is the use of wood alcohol absolutely forbidden in beverages, medicines and toilet preparations?

"3. Are your druggists, paint and varnish dealers, liquor dealers, grocers and barbers prosecuted for failure to comply with the above restrictions?

"4. Is wood alcohol used in any of your local industries? If so, are employers required to protect their workmen from poisoning by providing adequate ventilation?

"Your Board of Pharmacy, Department of Labor, Health Department and Commissioner of Excise have jurisdiction in this matter. Find out what they are doing about it. In the meantime, urge your druggists to give up the sale of wood alcohol, and urge your friends to use denatured alcohol instead. It is safer and cheaper than wood alcohol."

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Call for Volunteers.—Occupational diseases are to be systematically studied clinically, if the plan of the New York City Health Department works out.

"Close students of the trend of medicine will undoubtedly have observed that the diagnosis of occupational diseases will, in a short time, assume a most important rôle in preventive medicine. Manufacturers and working men alike are beginning to manifest no small interest in this phase of industrial hygiene.

"An unusual opportunity to do research work in the study of occupational diseases is now offered in the Occupational Clinic of the Department of Health recently established at No. 49 Lafayette Street. This clinic, though not yet fully equipped, already possesses the most important accessories for scientific clinical work.

"It is desired to secure the assistance of competent clinical workers in this field. A list of volunteers will therefore be established, from which to draw medical assistants for work in the clinic. In the Budget for 1916, request will be made for the establishment of a number of positions for clinic physicians at $300 per annum. The hours of work will be from ten a. m. to twelve or twelve-thirty p. m., three days a week. Those to whom this opportunity makes an appeal should make application in writing to the director of the Bureau of Preventable Diseases, Department of Health, New York City, stating their clinical experience."—*Weekly Bulletin*, June 12, 1915.

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First Aid Kits for Factories.—In order to meet the demand for a proper kit to be placed in industrial establishments and factories for first aid services to the injured, Dr. George M. Price has recently devised an apparatus of special value to the garment trades. The container consists of a white enamel metal box in which are placed four glass jars with aluminum covers containing the various bandages, dressings, instruments, and medicines. Explicit instructions are printed on the front drop of the box. The container is dust proof, portable, convenient and inexpensive. A detailed description follows:

"Jar No. 1 contains six half-ounce packages of cotton, individually wrapped and sealed. Jar No. 2 contains twelve sterilized and sealed packages of gauze and one half pound of assorted bandages. Jar No. 3 contains a roll of adhesive plaster, 3 per cent. sodium bicarbonate, petroleum ointment for burns, six drinking cups, safety pins, wooden applicators in a test tube, and a simple tourniquet consisting of a strip of cotton bandage one yard long. Jar No. 4 contains two ounces each of tincture of iodine (half strength), aromatic spirits of ammonia, and boric acid; a pair of scissors; artery clamps to be used as forceps for drawing out splinters or broken off needles; and an aluminum spoon. The cost of this simple first aid medical kit is $4.25."

In order that some one in every department may understand how to use the kit those industries which do not employ a factory nurse arrange for a monthly visit of a nurse who shall instruct various people in methods of treating accidents.—*New York Medical Journal*, June 26.

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Burns.—"Burns," says a recent issue of the Ford Motor Company's Publication "For You," "are one of the most common injuries received by factory employees. They are very painful, slow in healing and often result in lifelong disability or severe disfigurement.

"Fortunately burns at the time of accident are free from infection and, if kept clean, will

not result in blood poisoning. The best thing to do when you receive a burn is to leave it alone. *Don't touch it or put anything on it.* Go at once to the Medical Department where proper antiseptics and soothing remedies will be applied.

"The aftertreatment of burns consists mainly in keeping the injury clean and free from infection. Do not touch the dressings put on by the doctor, but present yourself regularly for treatment. *Come to the hospital.*"

✽

Protection Against Lead Poisoning in Printing Establishments.—The *Typographical Journal* for July contains an interesting note regarding the sanitary improvements being installed in the plants of the newspapers of Washington, D. C. Especial reference is made to the piping of typesetting and typecasting machines. The coöperation of the city health officer in bringing about this excellent improvement is mentioned.

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Investigation as a Basis of Hygiene Legislation For the Protection of the Worker.—Hemenway, in his recent work on "Public Health—Legal Principles and Administration," speaks of the necessity of basing legislation, directed toward the correction of sanitary and hygienic problems in industry, upon careful investigations. Enthusiastic reformers are too prone to urge legislation upon their own *ipse dixit* that the laws asked for will protect the health of the worker. Doctor Hemenway states that legislation fixing a maximum number of hours of work should be based upon careful studies relative to fatigue. He says: "In considering the hours during which persons may be engaged in any kind of labor, fatigue is a most important element. In this investigation of fatigue, one must discriminate between workers of different age and sex. A man may endure much longer confinement of labor than could a growing youth; and while a woman's constitution may enable her with less fatigue than a man, to do certain kinds of fine mechanical operation, she would be less able to stand many hours of heavy toil."

The necessity for careful study of conditions is even more necessary where the regulations are more specific and are intended for the prevention of occupational diseases.

Industrial hygiene workers, when they are interested in securing legislation, must remember that fundamentally a man has a constitutional right to use his body as he pleases and that restrictions upon this right are dependent upon the police power of the state governments, which is paramount only when circumstances which affect the health morals and safety or the fundamental welfare of the public are involved. It is, hence, of greatest importance that the arguments for such legislation as mentioned should be backed by the findings of a careful statistical investigation. Doctor Hemenway refers to an interesting case in support of his statements. In this case the Illinois court held a certain act to prohibit the use of emery wheels or emery belts in any basement room lying wholly or partly beneath the ground, invalid, as making an arbitrary discrimination without regard to the question of ventilation or other sanitary conditions.